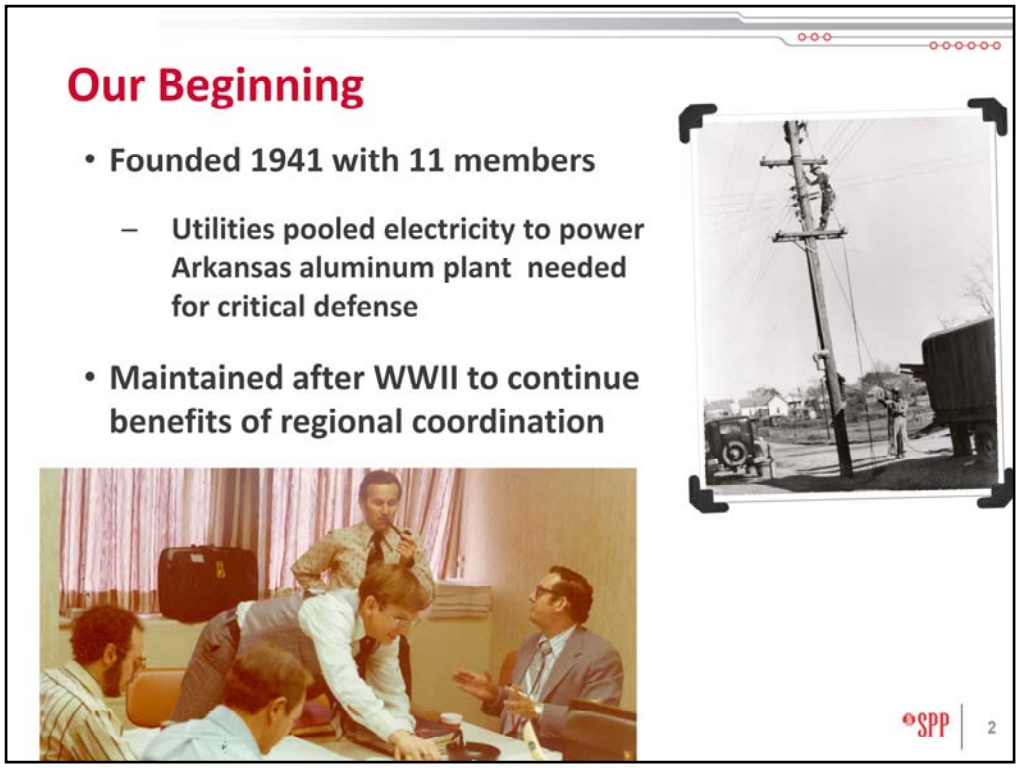
Helping our members work together to keep the lights on...
today and in the future
SPP Southwest Power Pool
Updated 2/28/2011



SPP's story began just after the attack on Pearl Harbor in 1941, when America had an immediate need to build airplanes. Aluminum is made from bauxite, and Arkansas had the largest bauxite deposit in the nation. A plant was opened at Jones Mill, Arkansas to produce aluminum around the clock.

Jones Mill required 120,000 kW of power to operate at full capacity, 24x7. However, the total power installed in the entire state of Arkansas was only 100,000 kW. There wasn't enough time to build new power plants.

On December 14, 1941, 11 regional utilities formed the Southwest Power Pool. The pooled power allowed Jones Mill to produce aluminum throughout the war.

The original 11 companies in SPP were: Arkansas Power and Light, Louisiana Power and Light, Mississippi Power and Light, Southwestern Gas and Electric Company, Public Service Commission of Oklahoma, Nebraska Power and Light, Texas Power and Light, Southwestern Power and Light, Oklahoma Gas and Electric, Kansas Gas and Electric, and Empire District Electric.

After the war, SPP continued to exist as a voluntary organization because our members recognized the growing interdependence of the electric grid, and realized the benefit in coordinating with neighboring utilities. Since World War II, one of SPP's key roles has been to bring its members together to discuss and make decisions about issues that impact the region.

SPP Milestones

1968	Became NERC Regional Council
1980	Implemented telecommunications network
1991	Implemented operating reserve sharing
1994	Incorporated as non-profit
1997	Implemented reliability coordination
1998	Implemented tariff administration
2001	Implemented regional scheduling
2004	Became FERC-approved Regional Transmission Organization
2006	Implemented contract services
2007	Launched EIS market, became NERC Regional Entity
2009	Integrated Nebraska utilities
2010	FERC approved Highway/Byway cost allocation methodology and Integrated Transmission Planning Process

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1968: NERC was formed in response to a blackout in the northeast. SPP was a founding member.

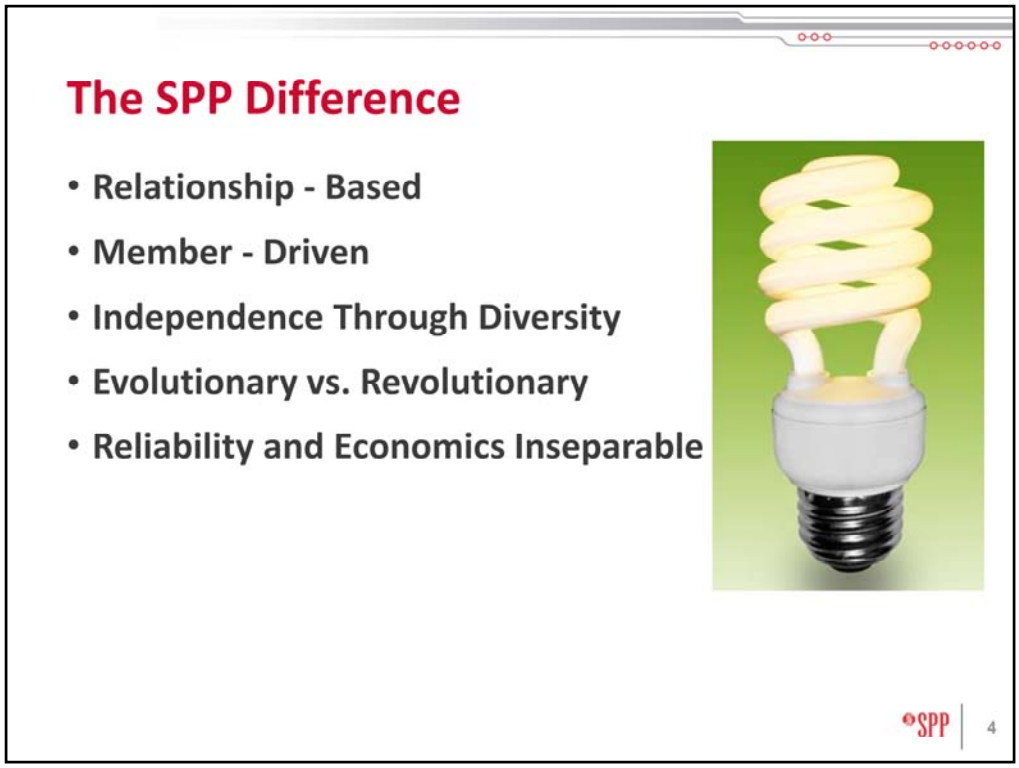
1980: SPP's members implemented a telecommunications network to facilitate information sharing.

1991: Reserve sharing allows all member systems to rely further on each other, reducing the reserves they each have to hold and making more power available for sale.

1997 - 2001: SPP added more services to provide regional benefit: reliability coordination, tariff administration, and scheduling.

2006: SPP began offering services on a contract basis.

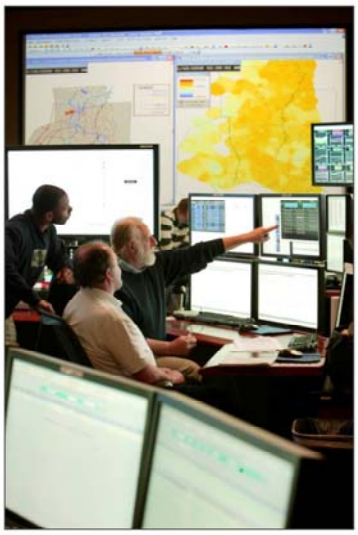
SPP did not even exist as a legal entity until 1994, and from 1941-1998 the SPP membership agreement was one paragraph. Many of our member companies have been working together for decades; these relationships are SPP's foundation and why being relationship-based is a key corporate strategy.



Our relationships with our members are very important to us. Our members drive SPP's major decisions and plans for the future. We have a diverse membership and an independent Board of Directors that make decisions in an evolutionary rather than revolutionary way. Our members' needs have changed over the years, and a deliberate evolutionary process has guided our growth. We believe that we can't discuss electric reliability without also discussing economic issues that impact us all. As a single organization addressing both reliability and economic issues, we provide cost- effective choices and bring efficiency to our members and our region.

SPP at a Glance

- Located in Little Rock
- ~475 employees
- $139 million operating budget (2011)
- 24 x 7 operation
- Full redundancy and backup site



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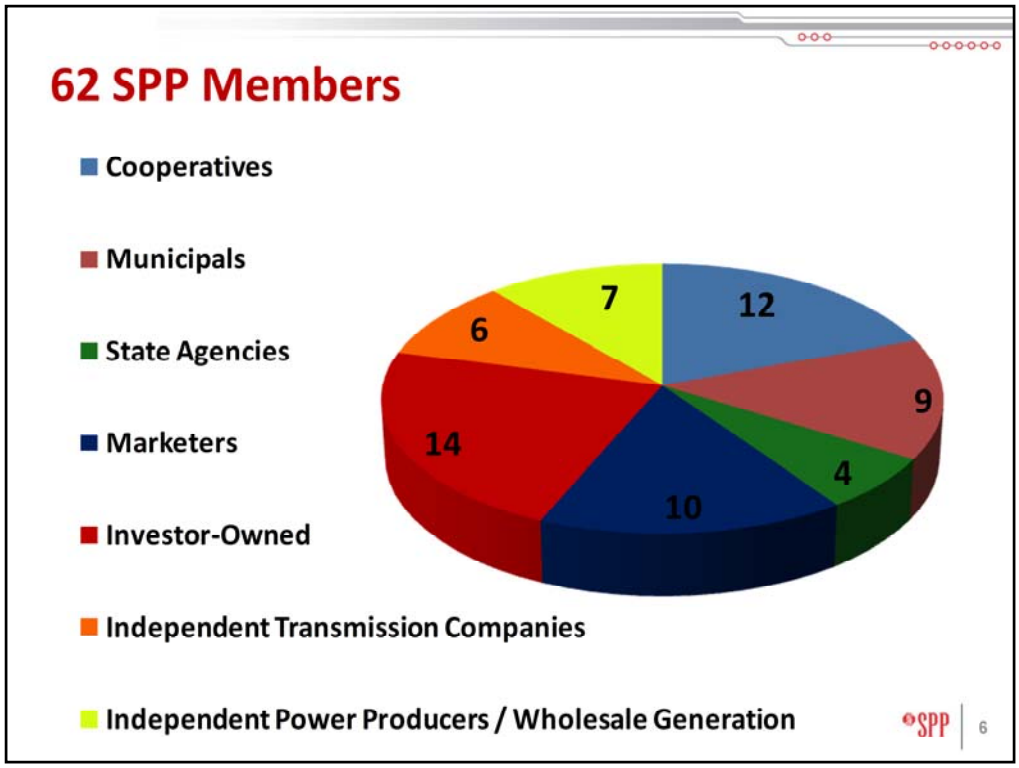
SPP is located in Central Arkansas. Our primary office is in Little Rock, and our 24x7 operations center is in a Little Rock suburb.



SPP has one of the most diverse memberships of any Regional Transmission Organization. This diversity helps ensure independence; we carefully balance diverse interests in our decision-making processes.

Investor Owned Utilities: Traditional vertically-integrated utilities

Cooperatives: Rural electric cooperatives

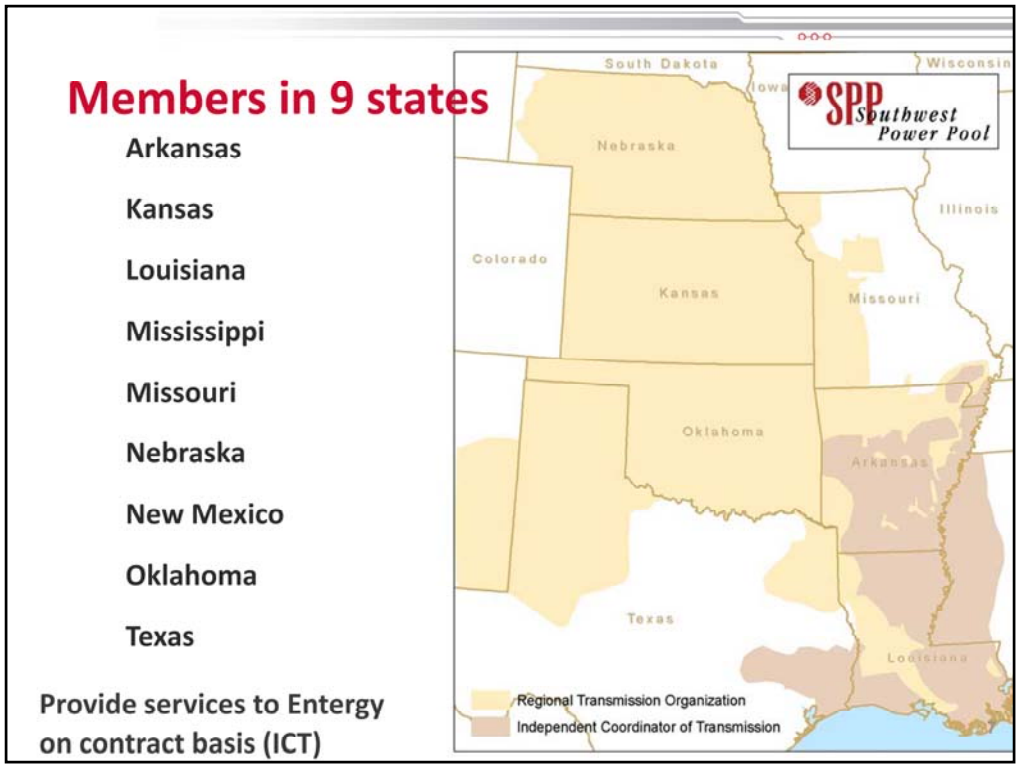
Municipals: Cities

State Agencies: State-created agencies that own/operate facilities

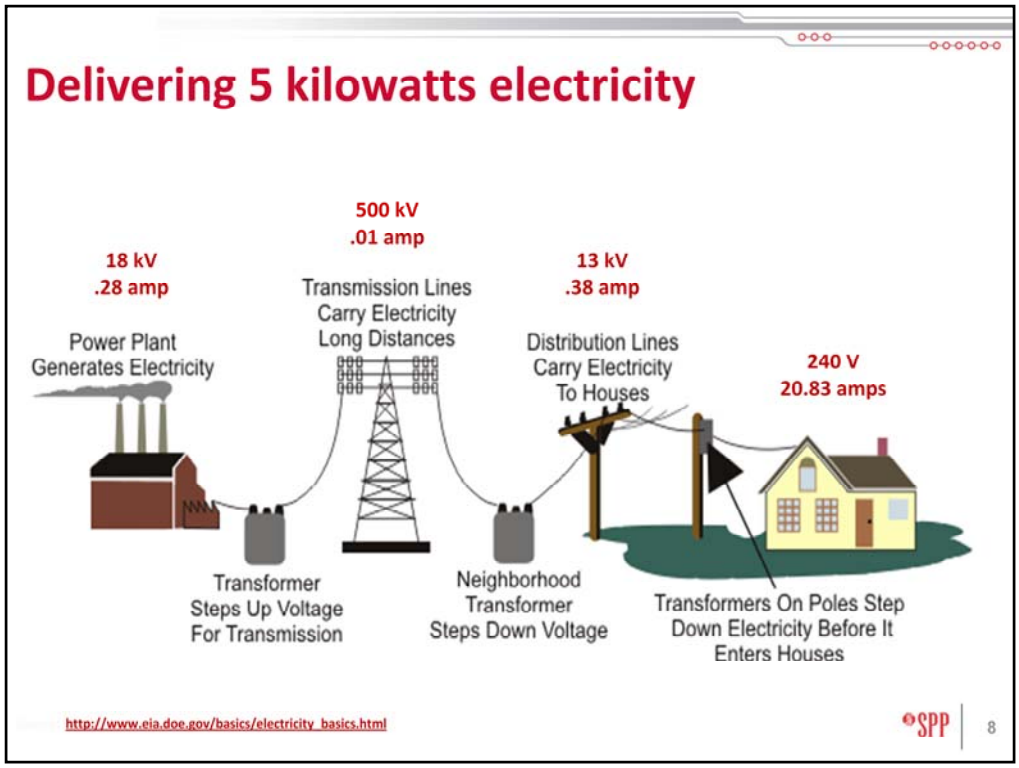
Independent Power Producers/Wholesale Generation: Entities that develop and own generation, but don't own transmission

Independent Transmission Companies - Entities that develop and own transmission, but don't own generation

Marketers: Entities that own no facilities or transmission, but buy/sell excess capacity



The SPP Regional Transmission Organization manages the power grid in all or part of eight states; we also have a member in Mississippi. SPP also serves as the Independent Coordinator of Transmission (ICT) for Entergy on a contract basis.



Electrical power starts at the power plant. In almost all cases, the power plant consists of a spinning electrical generator that is powered by a steam turbine. The steam might be created by burning coal, oil or natural gas. Or, the steam may come from a nuclear reactor.

Power leaves the generator and enters a transmission substation at the power plant. This substation uses large transformers to convert the generator's voltage up extremely high for long-distance transmission on the transmission grid.

Watts (power) = voltage x current (amps). In this example, 5 kilowatts of power are moving from the generating plant to a home.

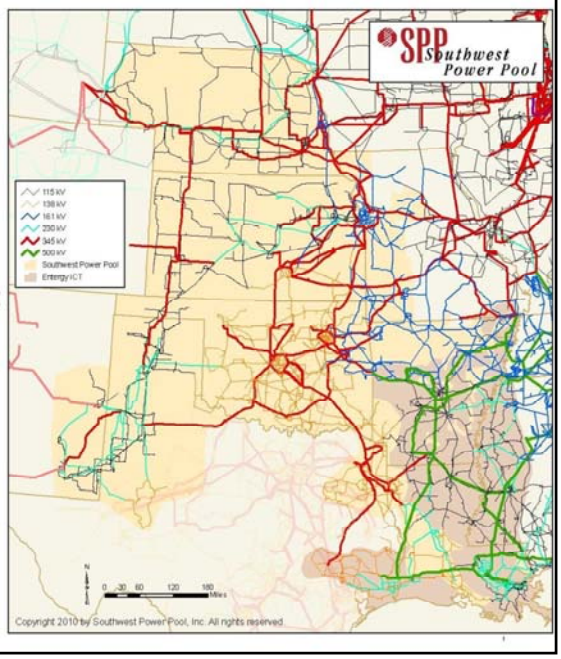
Electricity is the flow of electrons through a conductor.

Current is the measure of the flow of electrons passing through a given point in a circuit in a given amount of time.

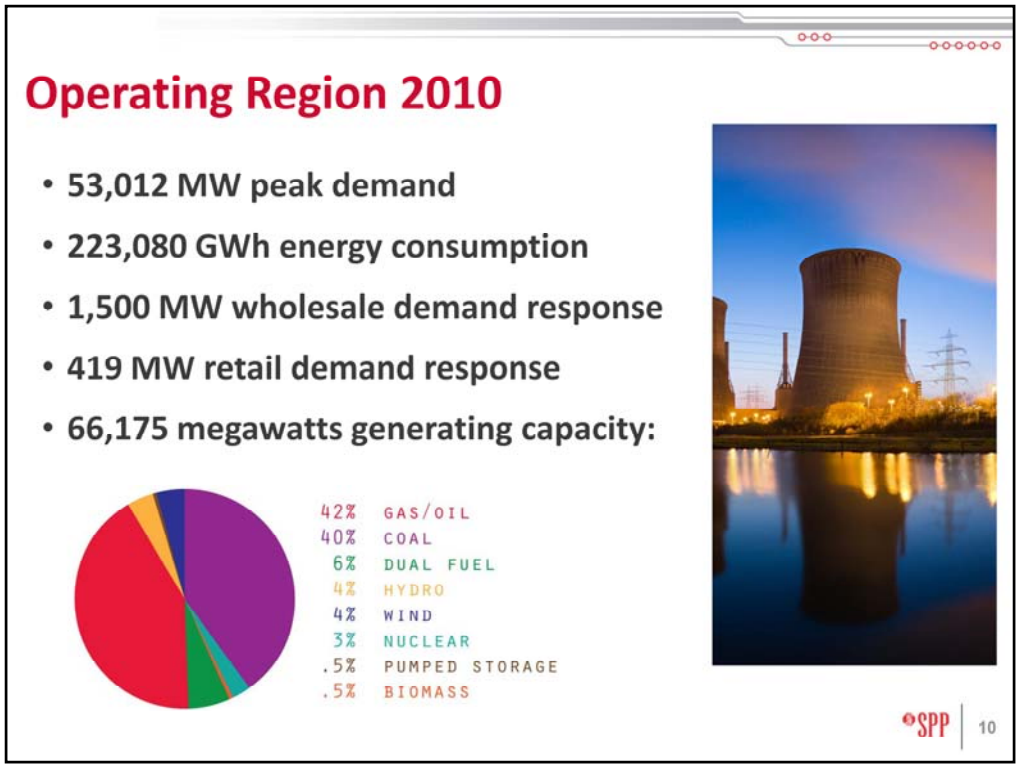
Voltage is the measure of *difference* of potential (electrical force) between two points. Voltage is the pressure that pushes the current. You must have voltage and current to move electricity.

Operating Region 2010

- 370,000 square miles service territory
- 859 generating plants
- 6,101 substations
- 48,930 miles transmission:
  - 69 kV – 12,722 miles
  - 115 kV – 10,143 miles
  - 138 kV – 10,009 miles
  - 161 kV – 5,097 miles
  - 230 kV – 3,787 miles
  - 345 kV – 7,079 miles
  - 500 kV – 93 miles



These statistics are for the RTO footprint; the map depicts transmission for both the RTO and ICT (Entergy) footprints.



The non-coincident peak load was set on 8/11/2010 for the Reliability Coordinator footprint. Non-coincident peak is the sum of each footprint's members' peak energy use for a particular day.

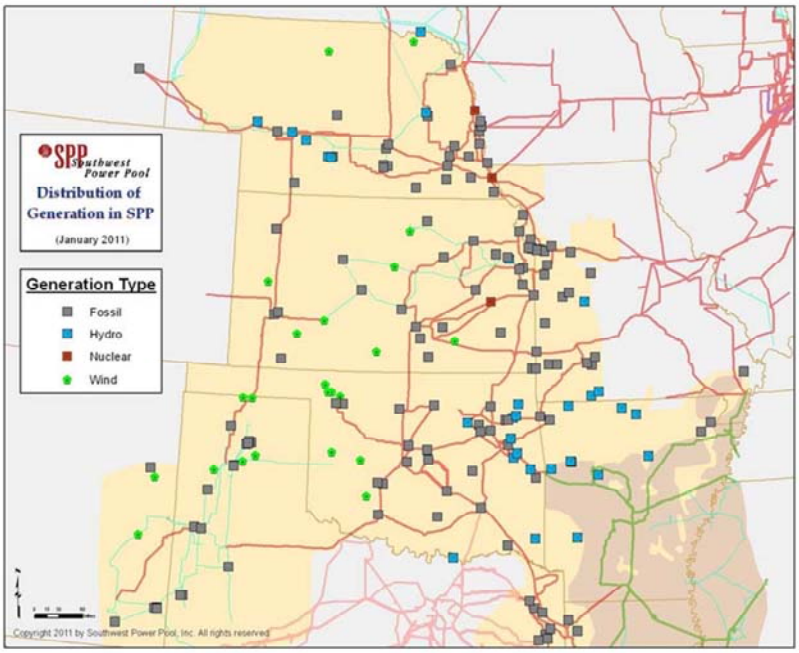
The energy consumption number represents the summed hourly average of the amount of energy used by retail customers in the market footprint.

SPP's demand peaks in the summer. Generating capacity (depicted for the RTO footprint) represents what our region's generating units are capable of producing during peak season. The generating units do not always run at this capacity. This is similar to saying your car is capable of producing 200 horsepower, even though you may not use all that horsepower all the time.

The wholesale demand response number is for the market footprint and represents resources co-located with load and behind-the-meter. The retail demand response number is for the RTO footprint and represents retail load-reducing resources.

Read more about SPP’s footprints on SPP.org>Fast Facts>Footprints

Generating Resources



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Did You Know?

- SPP's members serve over 6.2 million households.
- In 2010, SPP members completed 78 transmission projects totaling $468 million.

- SPP's transmission owners collect ~$800 million annually to recoup costs of transmission, and have over $4.7 billion in net transmission investment.
- 48,930 miles of transmission lines in SPP's footprint would circle the earth - almost twice!

- SPP's 2010 transmission service and wholesale market transactions totaled ~$1.98 billion.

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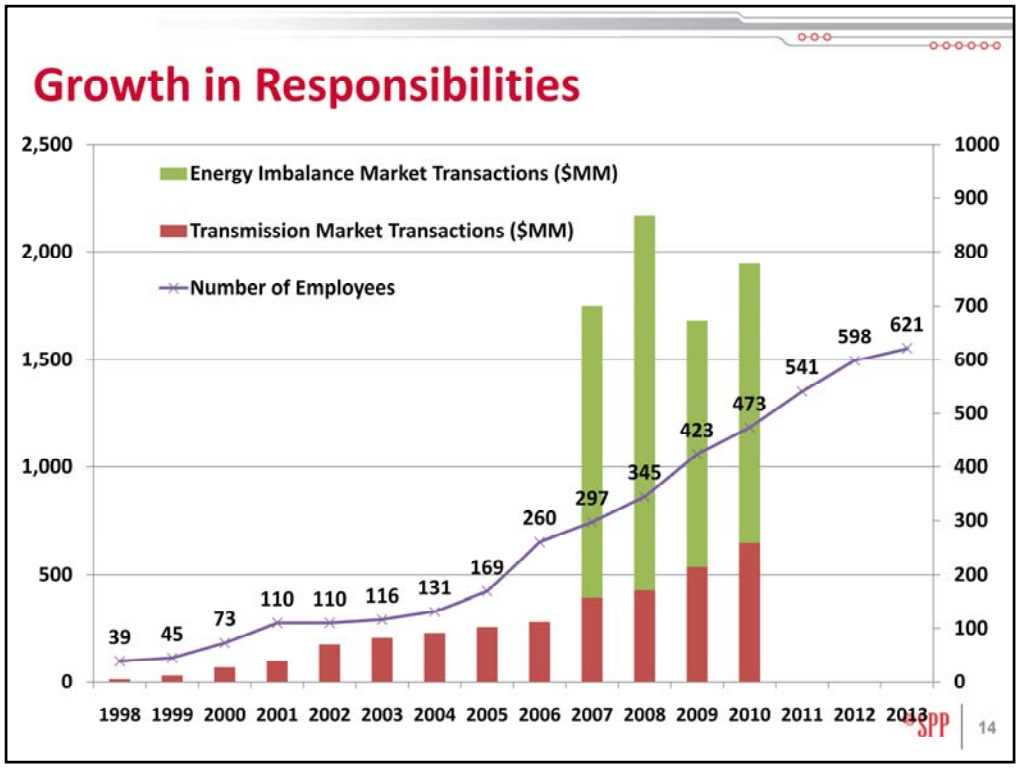
These statistics are for the RTO footprint.

IT Facts

- ~75,000 data points updated every 10-30 seconds
- Operations model solves 20,000 x 20,000 matrix every 2 minutes
- 614 servers
- 496 Terabytes of data storage
- Fully redundant networks with 100% availability
- Operate two data centers

SPP has a large IT staff and a very complex IT environment to support regional transmission grid operations.



SPP's staff size has grown in recent years as we have added new services. Our customers' transmission and wholesale energy market transactions have also grown.

SPP's New Facility Now Under Construction

Northwest Elevation

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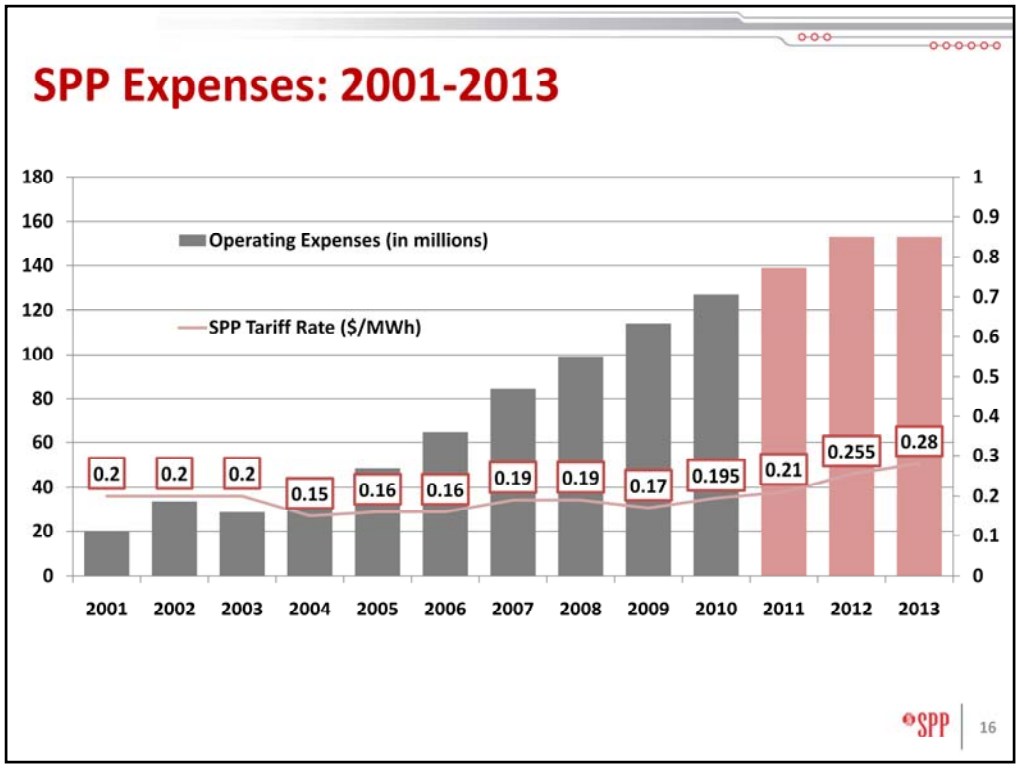
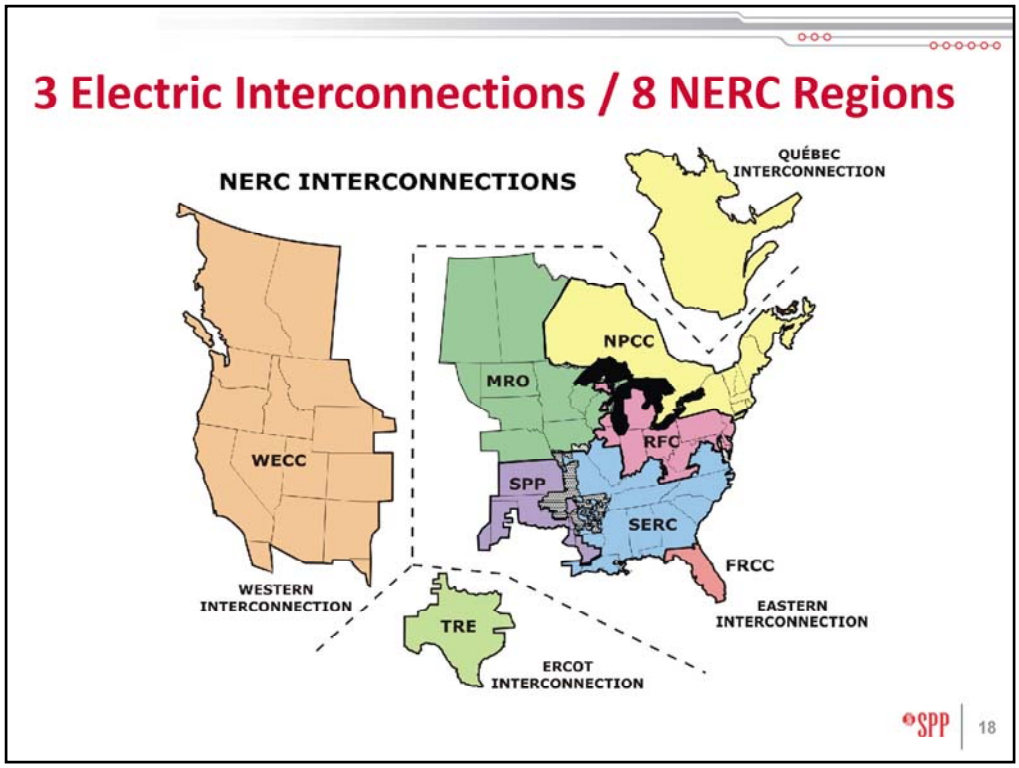
SPP is building a new campus in Little Rock to consolidate its existing three locations. The campus is expected to be completed in 2012.



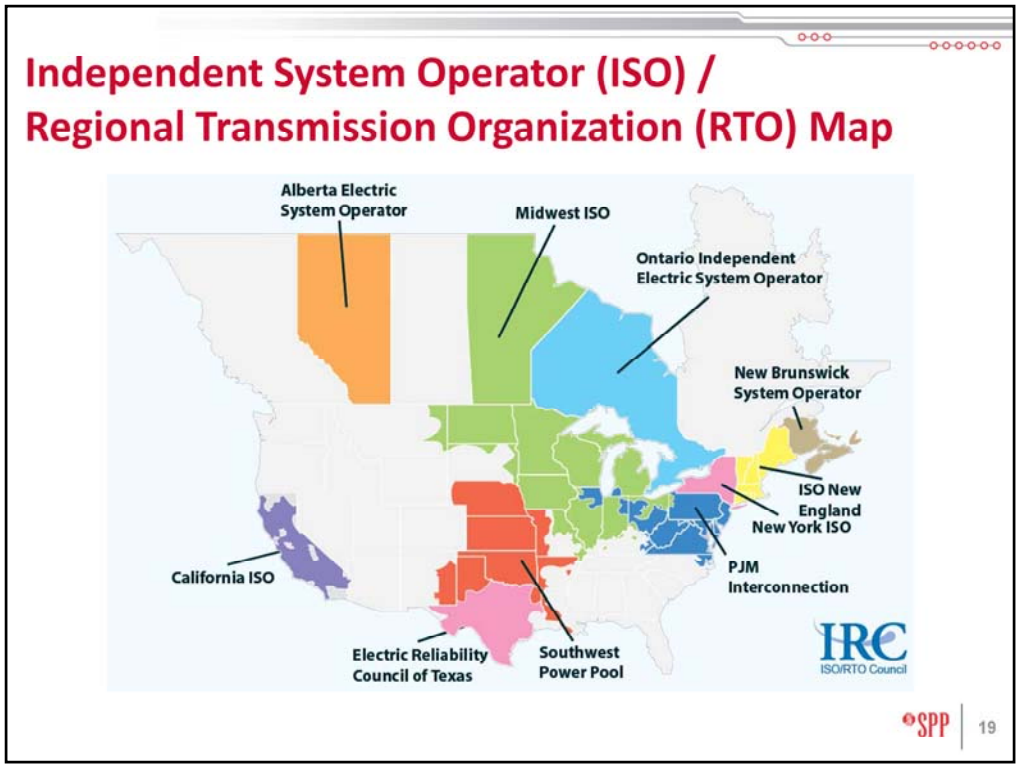
Even as our staff and operating expenses have grown, our administrative fee (the amount SPP charges our members for the services we provide) has remained low compared to other ISOs/RTOs. The 2012-2013 fees are estimates.

SPP is regulated by the Federal Energy Regulatory Commission (FERC). SPP was approved as a FERC Regional Transmission Organization (RTO) in 2004. We operate subject to a tariff that is filed with and governed by FERC. This tariff contains over 2,100 pages of rates, terms and conditions for providing transmission service to our eligible customers to move wholesale electric power within and across our footprint.

SPP is a founding member of the North American Electric Reliability Council (NERC). We became a NERC Regional Entity in 2007, which gives us the responsibility of enforcing reliability standards for users, owners, and operators of the bulk power system in the SPP footprint.



This NERC map shows the other NERC Regional Entities and the three electric interconnections. (Nebraska is not included as part of the SPP region on this map, because SPP's Nebraska members are part of the MRO Regional Entity, not the SPP Regional Entity. Nebraska is part of the SPP Regional Transmission Organization.)



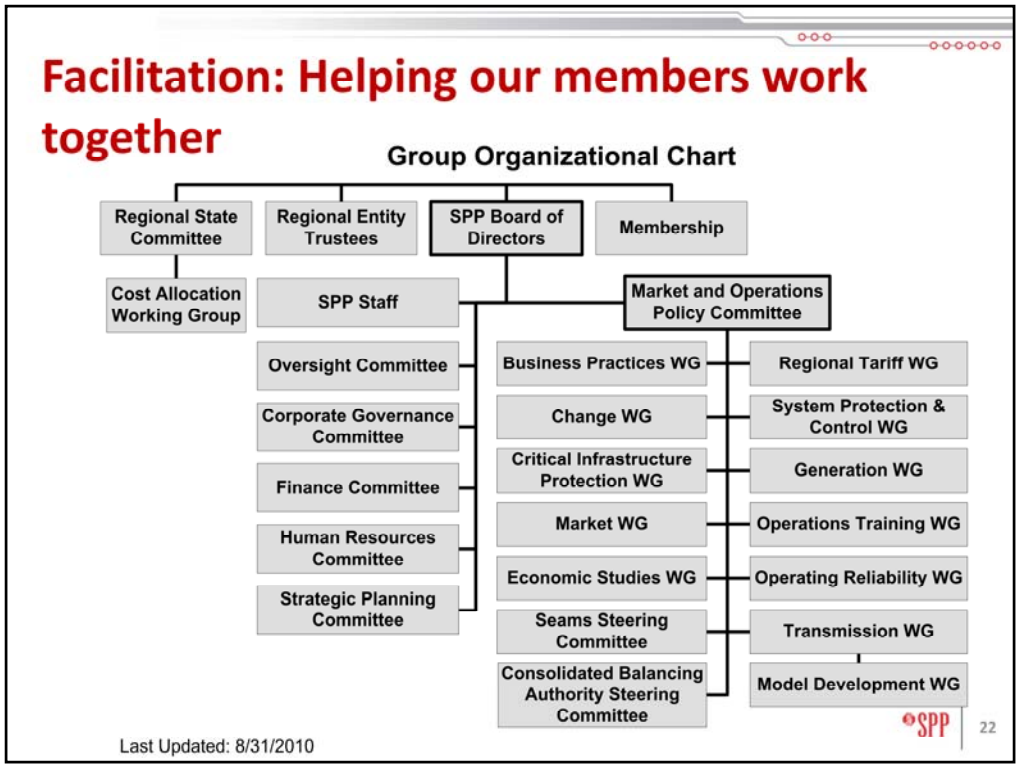
This map depicts the 10 other FERC-approved Independent System Operators and Regional Transmission Organizations in the United States and Canada.

SPP is a member of the ISO/RTO Council (IRC), an organization of 10 ISOs/RTOs. The IRC collaborates on issues of joint concern. We are also involved with NAESB and NARUC.

SPP participates in several interregional planning efforts, and is working with our neighbors on seams agreements, which determine how neighboring transmission providers interact at their borders. The United States bulk power system is the most complicated and extensive machine in existence. The skilled people who operate it must find a way to make fair and efficient interregional cost allocations and seams agreements a reality to ensure the reliable supply of electricity to meet the ever-growing needs of electricity consumers.

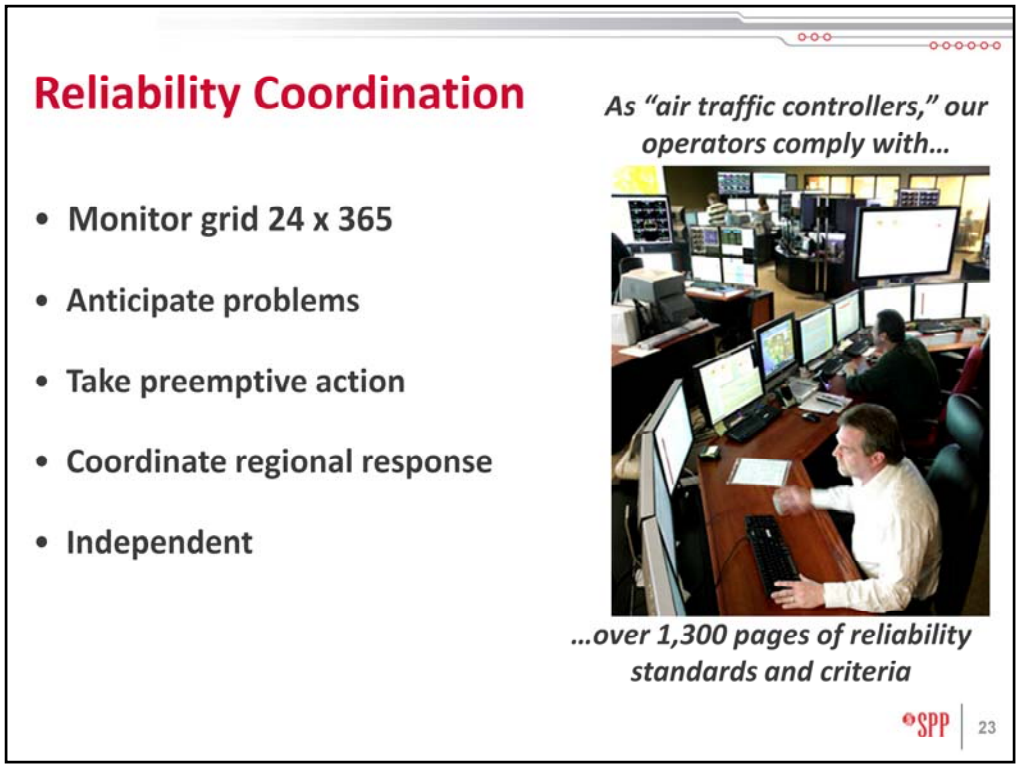
We offer a number of services for our members, including:
• Facilitating meetings and decision-making processes
• Monitoring the grid to maintain electric reliability
• Processing requests for use of the transmission grid under a tariff with consistent rates and terms for all participants
• Operating a wholesale energy market
• Ensuring that users, owners, and operators of the bulk transmission system are in compliance with federal reliability standards
• Creating regional reliability standards
• Planning for future transmission needs

With all of our services, we focus on being regional, independent, and cost-effective. Our overarching goal is maintaining electric reliability.



Over 500 stakeholders are involved in SPP's organizational structure of committees, working groups, and ad hoc task forces. This member involvement drives SPP's decision-making and strategic direction.

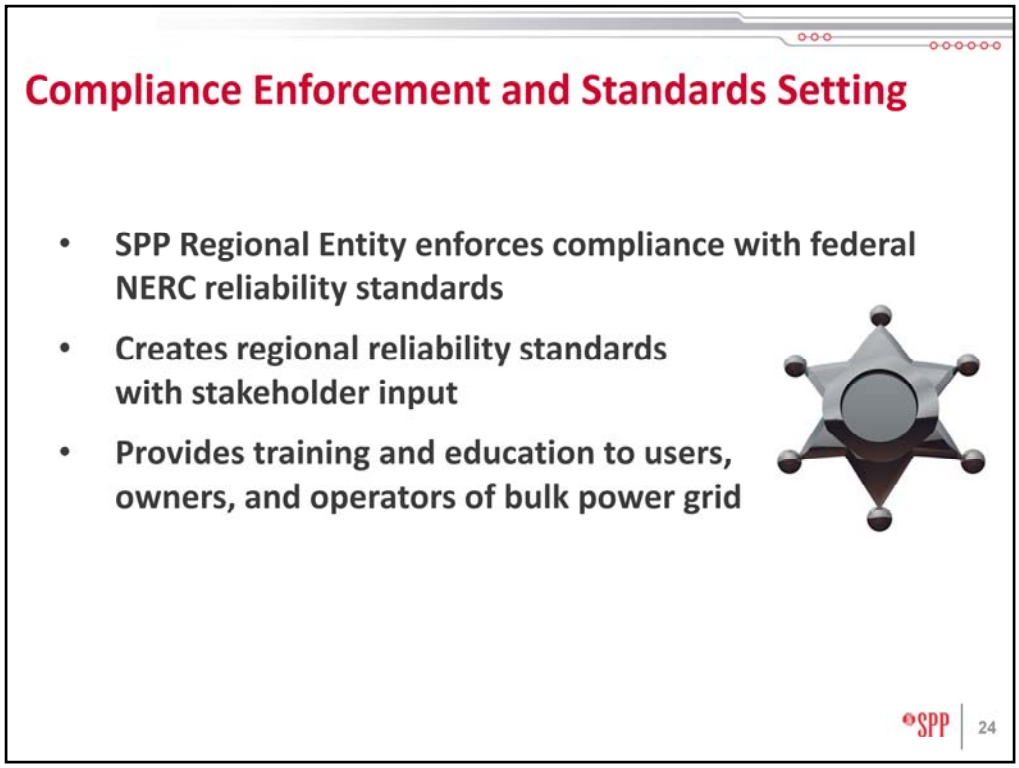
Any and all opinions are heard loudly and clearly in organizational group meetings. The rosters of our organizational groups match the diverseness of the membership, requiring representatives from across the footprint and recognizing different member types and sizes.



SPP independently operates the regional wholesale power grid under rules and regulations of the North American Electric Reliability Corporation and the Federal Energy Regulatory Commission. SPP doesn't own the electric transmission grid. Similar to how air traffic controllers monitor airspace, we monitor the grid 24x7 to maintain electric reliability and mitigate grid emergencies. We constantly analyze computer models that show us the current state of the electric grid for an eight-state region - such as lines in service, generators operating, and voltage levels - so we can be prepared for the next worst contingency or emergency that could occur.

Our reliability coordinators follow over 1,300 pages of reliability standards, and are authorized to decisions to protect overall power grid infrastructure and ensure the lights stay on.

(We monitor the large transmission lines, not the distribution lines that go to homes.)



SPP is one of eight Regional Entities (RE), designated by NERC to enforce NERC-approved electric reliability standards for users, owners, and operators of the bulk power system. The SPP RE also creates regional reliability standards with input from those users, owners, and operators. These rules are in place to prevent and mitigate grid emergencies such as overloaded lines and outages, and to maintain electric reliability and the integrity of the power grid.

An analogy is that the SPP RE serves as the “traffic cop” for regional reliability in the SPP region; it is authorized to levy financial sanctions for failure to comply with FERC-approved NERC and SPP Reliability standards.

Training

- 2010 Training program awarded over 21,000 continuing education hours to 410 operators from 25 member companies
- SPP offers:
  - Regional/sub-regional restoration drills
  - System operations conferences
  - Regional emergency operations sessions
  - Train-the-Trainer classes

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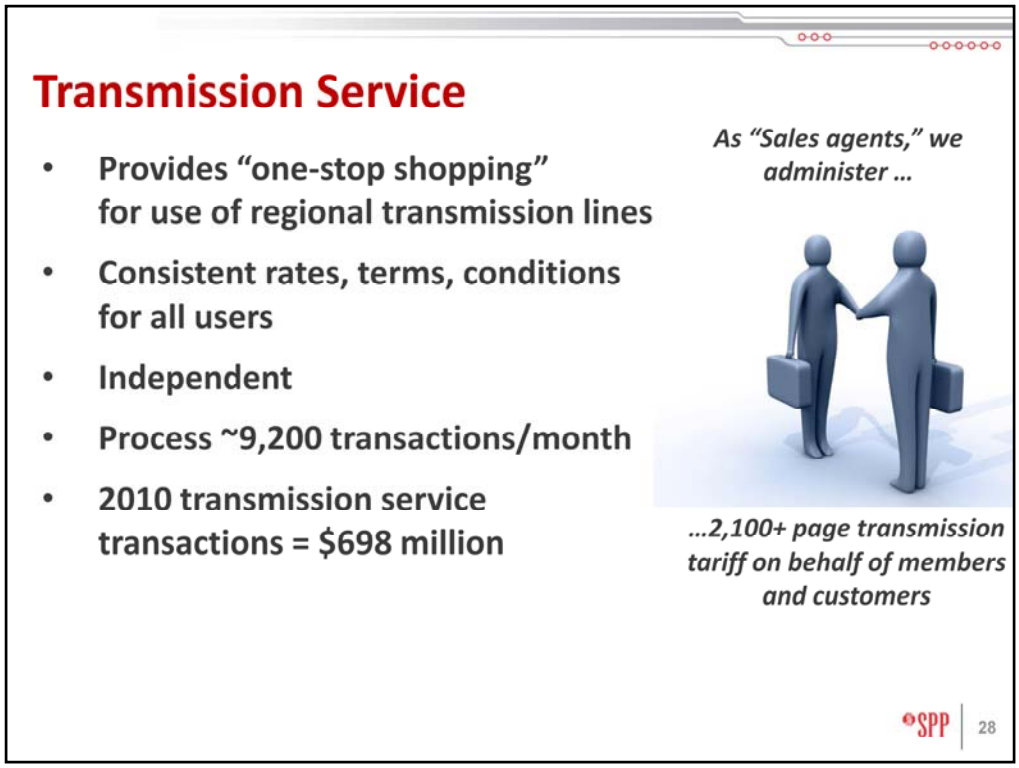
SPP is an industry leader in regional black start drills. In a black start drill, we simulate a blackout across the entire region. Member operators can log-in from their offices or at SPP's training center to practice bringing the grid back online. We offer a number of other training classes that help our members' operators maintain their NERC certifications.

MARKETS

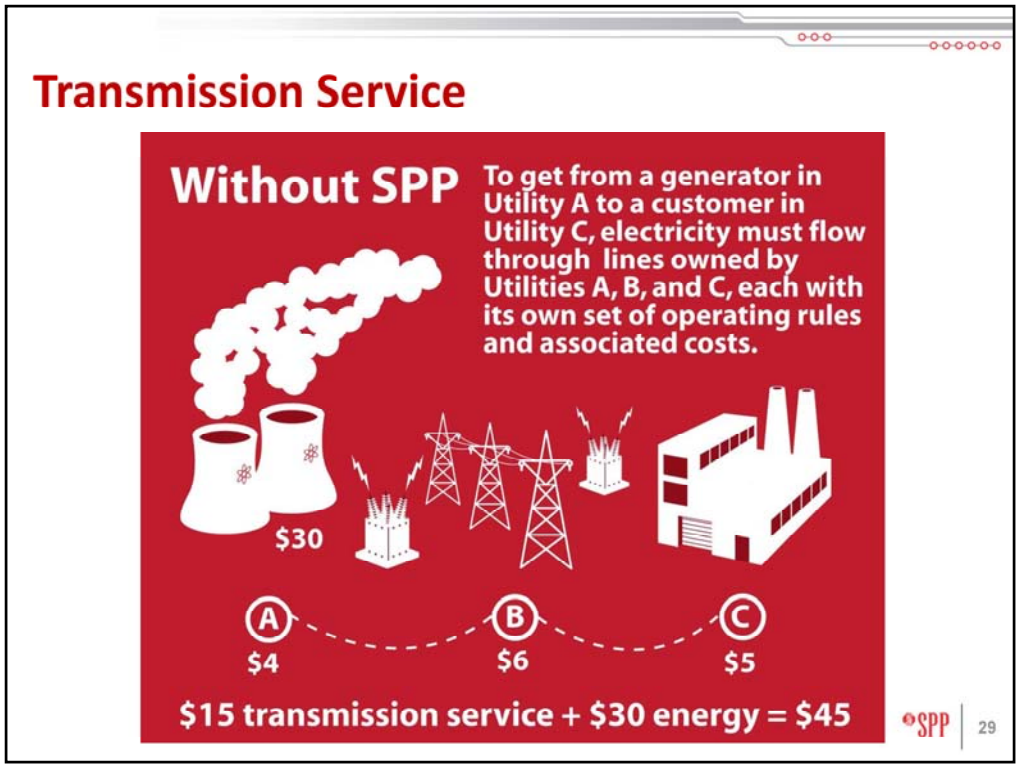
What kind of markets does SPP have now?

- **Transmission Service**: Participants buy and sell use of regional transmission lines that are owned by different parties
- **Energy Imbalance Service (EIS)**: Participants buy and sell wholesale electricity in real-time
  - Market uses least expensive energy from regional resources to serve demand (load) first
  - Sometimes it's less expensive for a participant to purchase power from another provider than to generate
  - SPP monitors resource/load balance to ensure system reliability

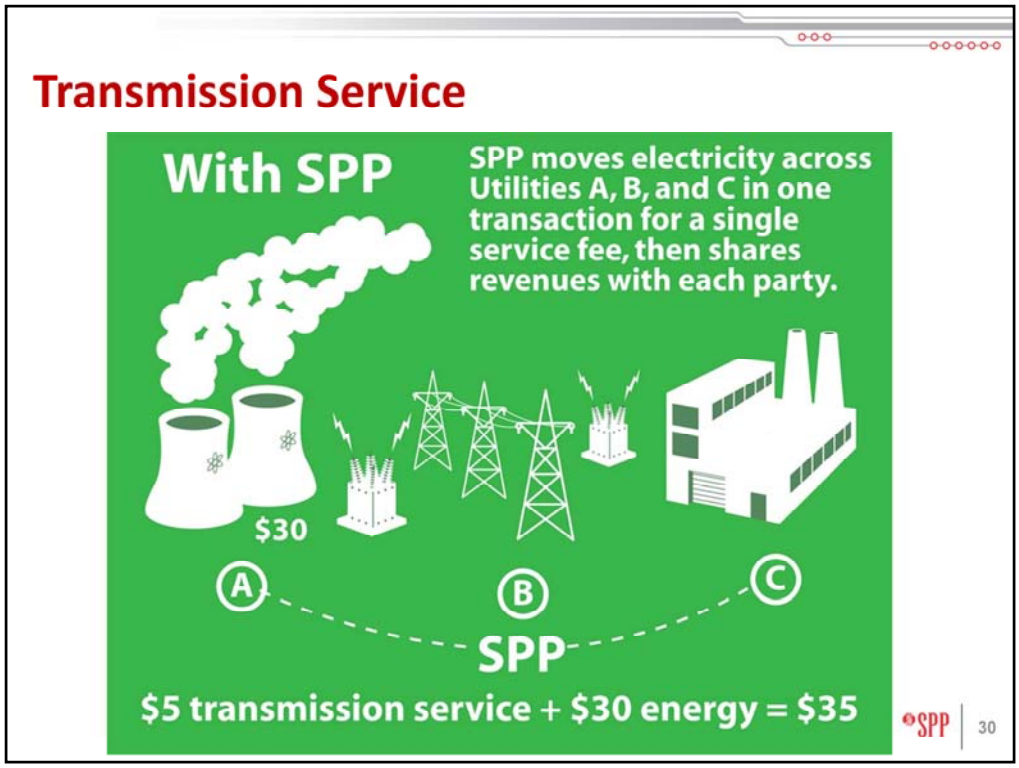


We act as "sales agents" for our members at a one-stop-shop for use of the transmission grid.

SPP is independent in that we don't favor one utility or another when we process transmission requests. SPP's Open Access Transmission Tariff regulates use of the transmission grid. This tariff was approved by FERC and has consistent rates, terms, and conditions for all transactions.



Transmission lines are owned by different companies that “rent” use of their lines. Sending power from a generator to customers may require the use of lines owned by multiple parties that each impose a fee. In this “without SPP” example, moving power from Point A to Point C required three transactions. Three transmission service fees were imposed for a total of $15. Added to the cost of the energy, the total fee is $45.



SPP simplifies the transmission service process by handling each request from beginning to end under a single set of rules and rates. Customers make just one transmission service reservation rather than having to contact multiple parties to request service under differing rules and rates.

In this example, SPP's service fee is $5, added to the cost of the $30 energy, for a total transaction fee of $35.

SPP collects and returns revenues for these transactions to transmission owners. As a non-profit organization SPP does not retain proceeds, though there is a "sales fee" per megawatt hour.

All participants benefit from the increased economic activity the transmission market creates.

How transmission service works

- Reserving transmission service
  - Like buying e-ticket to reserve seat on plane
  - Customer specifies priority, time, source/sink, capacity
  - Tariff administrator approves if capacity exists
- NERC Tag is issued
  - Like receiving boarding pass for plane
  - Won't be approved if improper use of reservation
- Schedule is created from Tag. When approved:
  - Like sitting on the plane
  - Generators ramp to provide energy for transaction
  - May be curtailed if transmission system overloaded

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When an entity reserves transmission service, it is like buying an airline e-ticket. When you buy a ticket, you're reserving your seat on the plane. When you reserve transmission service, you are reserving your electricity on the transmission line. The customer specifies the desired priority, time frame, source (origination), sink (destination), and capacity. If there is sufficient capacity on the transmission line, the SPP tariff administrator will approve the request for transmission service.

After the entity buys or sells the transmission, a "NERC Tag" is generated. The tag is like a boarding pass. The tariff administrator will not approve the tag if it is improperly reserved - like you wouldn't get a boarding pass if there was a problem with your plane reservation.

Then a schedule is created from the tag. Having your schedule approved is like sitting on the plane. All parties have fulfilled their part of the contract. Once the schedule is approved, generators begin to move to provide energy for the transaction.

If the plane is too heavy, people or luggage may have to be offloaded. If the transmission system is overloaded, the transmission schedule may be curtailed.

Using the airline analogy, SPP's tariff administration and scheduling staff are like ticket and gate agents.

Market Operation

- Monitors supply/demand balance
- Ensures economic dispatch of generation while maintaining reliability
- Provides settlement data
- 32 participants
- 405 generation resources
- 2010 wholesale market transactions = $1.28 billion

SPP's energy market is like the "NYSE"…

…and follows over 200 pages of market protocols

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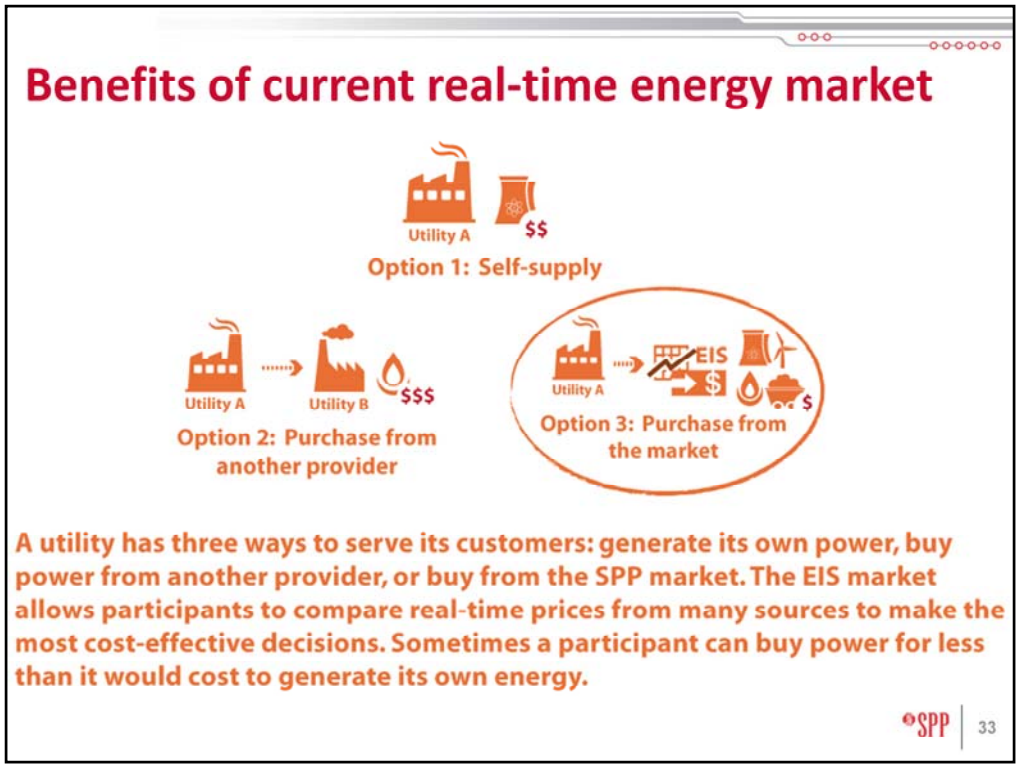
SPP's Energy Imbalance Service (EIS) market is like a stock market for energy. In the EIS market, participants buy and sell wholesale electricity in real-time. If a utility requires more energy than it scheduled, the market provides the utility another option to buy the "extra" energy at real-time prices to make up the difference and meet its demand.

SPP facilitates this marketplace and monitors the balance of resources and load. We work to ensure that less expensive power is used to serve load before expensive power, as long as reliability is met.



Participants can use the market to get the least expensive available energy from other utilities. Demand response is another way to meet demand for electricity; currently, SPP does not have very much demand response in our market.

Why develop new markets?

- SPP conducts complex cost-benefit studies before beginning new market development
  - Under Regional State Committee oversight
  - 2005 Charles River Associates analysis of EIS market:
    - Estimated benefit of $86 million for first year
    - Actual benefit of $103 million for first year
- Integrated Marketplace will bring estimated annual average **additional net benefits of $100 million**
  - According to 2009 Ventyx analysis

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What type of new markets is SPP implementing?

- Integrated Marketplace will:
  - Provide participants with greater access to reserve energy
  - Improve regional balancing of supply and demand
  - Facilitate integration of renewable resources
- Includes:
  - **Day Ahead**: SPP determines what generating units should run the next day for maximum cost-effectiveness
  - **Operating Reserves**: Market to buy and sell reserve energy that
    - Meets emergency needs
    - Regulates instantaneous load and generation changes
    - Maintains electricity quality (keeping voltage up, etc.)

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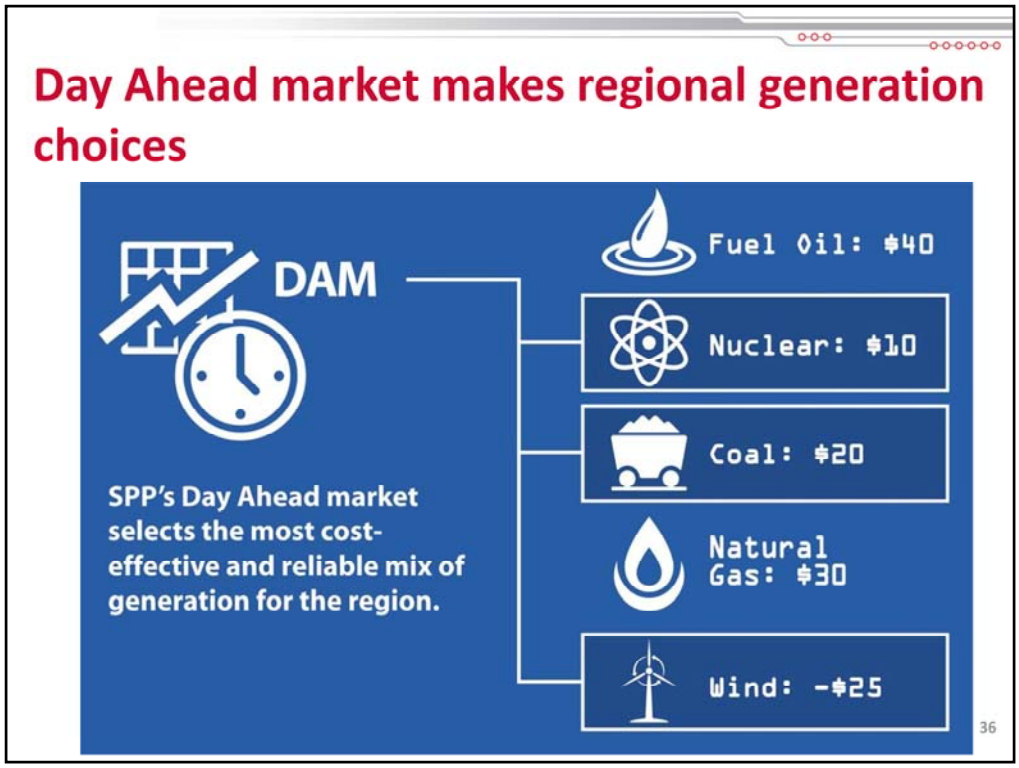
SPP expects to implement the Integrated Marketplace in 2014.



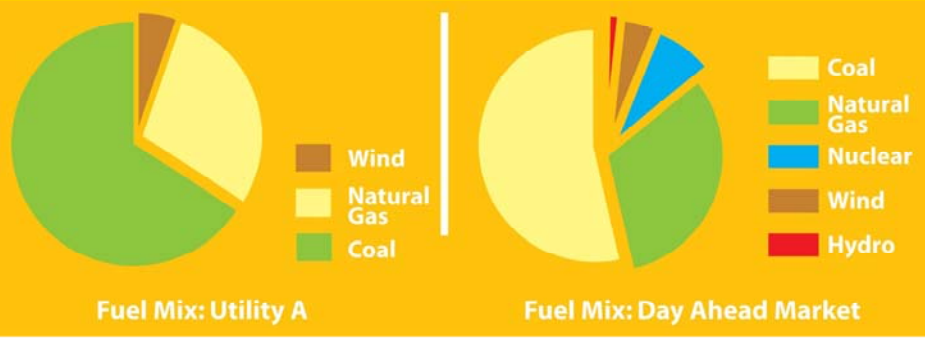
The new Day Ahead market will optimize generation choices for the entire SPP footprint. The market will determine which generating units should run the next day for maximum cost-effectiveness, based on resources available for the region. Regional commitment of generation (rather than individual utilities committing their own generation) will reduce overall costs for the footprint.

Currently, each market participant decides which generation it will run the next day to meet its own needs, based on knowledge of its own system. Generation choices are limited, and market participants may incur costs that could be avoided. For instance, if a high-cost generator is turned on but kept at a minimum, this costs the utility money.

In the Day Ahead market, participants will make bids and offers for the next day's demand (load) and generating resources (supply). Market participants can offer electricity for sale and bid to buy electricity. The market puts bids and offers together so participants will know how much energy will be supplied the next day and how much it will cost.

Day Ahead market offers regional diversity

The centralized market could provide access to a more diverse fuel mix than might be available to an individual utility.



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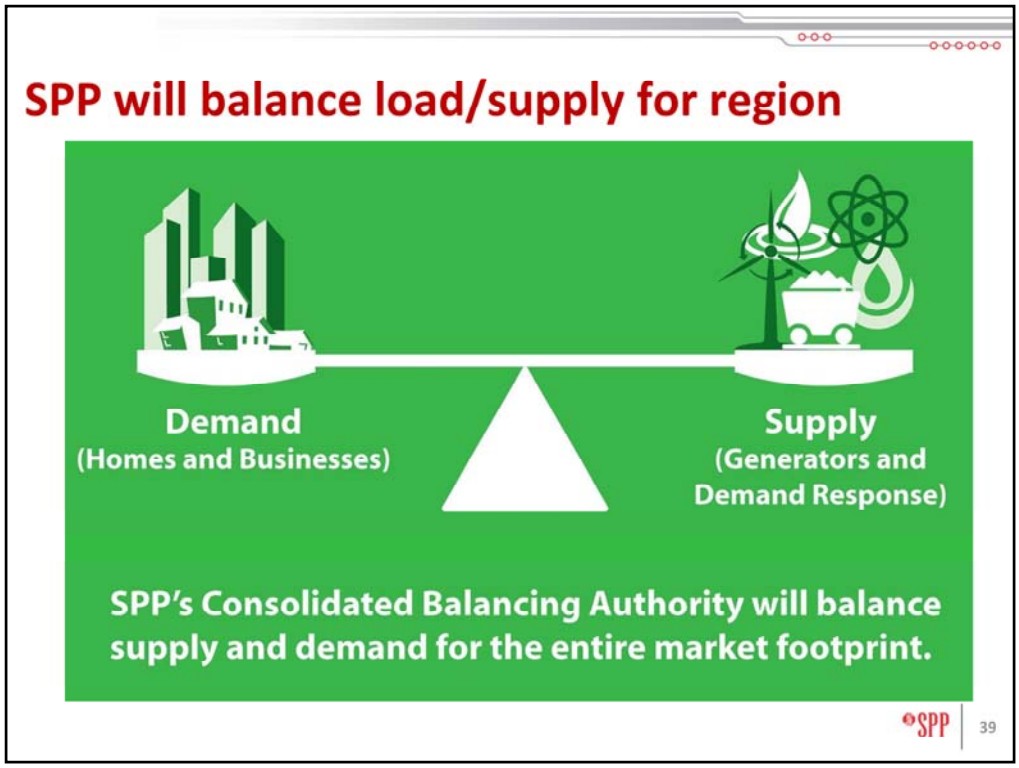
The Operating Reserves market will provide participants with greater access to reserve electricity, improve regional balancing of supply and demand, and facilitate the integration of renewable resources. In the Operating Reserves market, participants can buy and sell reserve electricity that is used to meet emergency needs and regulate load changes. The kinds of reserve energy available in the market will be:
•Supplemental reserves: Generation that is offline but ready to be generating within 10 minutes.
•Spinning reserves: Generation that is on and consuming fuel, but not contributing to energy needs. Spinning reserves can provide power almost immediately.
•Regulation reserves: Generation required to maintain the quality of electricity, such as maintaining the balance between demand and generation.

In addition to providing system stability, greater access to reserve energy helps facilitate the integration of large amounts of renewable energy into the electric grid. Renewable generation sources such as wind and solar are highly variable; grid operators cannot predict exactly when the wind will blow or the sun will shine.

If renewable generation suddenly increases or decreases, other sources of generation must quickly ramp up or back down to keep an uninterrupted power flow. The Operating Reserves market will support participants' ability to quickly meet changing generation needs.

The market will improve balancing of generation and load across the region. Because electricity cannot be stored efficiently, maintaining balance between supply and demand must be accomplished by physically adjusting generators up or down (or by managing the demand side of the equation; demand response is a new frontier in the industry).



SPP's future markets will require all participants to be part of the same Balancing Authority (BA). BAs ensure that at every moment in time, and in plans for future times, there is sufficient generation to reliably supply electricity.

SPP's BAs include investor-owned utilities, public power, municipalities, and electric cooperatives. SPP is combining these BAs into one entity; SPP will serve as the Consolidated Balancing Authority (CBA) for the entire market footprint. As the CBA, SPP will balance supply and demand for the region, maintain frequency, and maintain electricity flows between adjacent BAs. The CBA must meet numerous NERC standards and criteria, and will have an obligation to NERC to meet performance standards.

The CBA will provide economic incentives and structure for the most efficient regional grid operation. With SPP as the CBA, the amount of regulation reserves individual market participants are required to carry will be reduced. The consolidated structure will offer market participants more reserve resources from which to draw, allowing the region to meet NERC standards more efficiently.

The CBA will facilitate centralized unit commitment, in which the Day Ahead market determines what generation should be utilized for maximum regional benefit.

TRANSMISSION PLANNING

Generation = 60% Retail Electricity Rates

Without transmission, we can't deliver this capital-intensive generation to where it's needed across region

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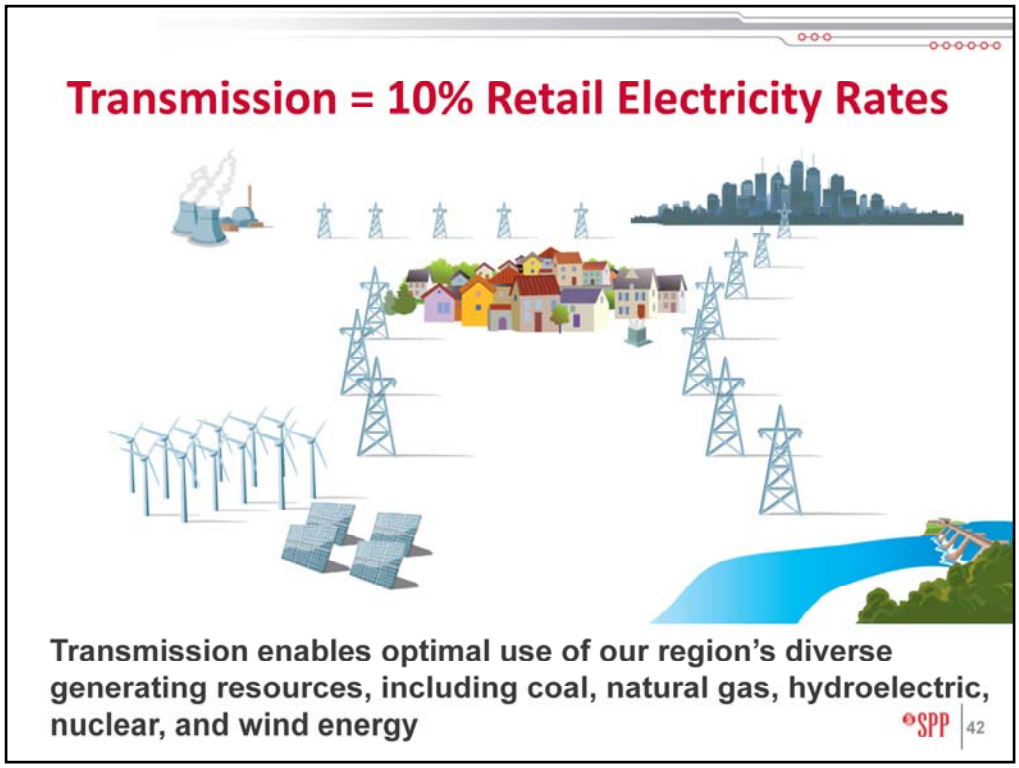
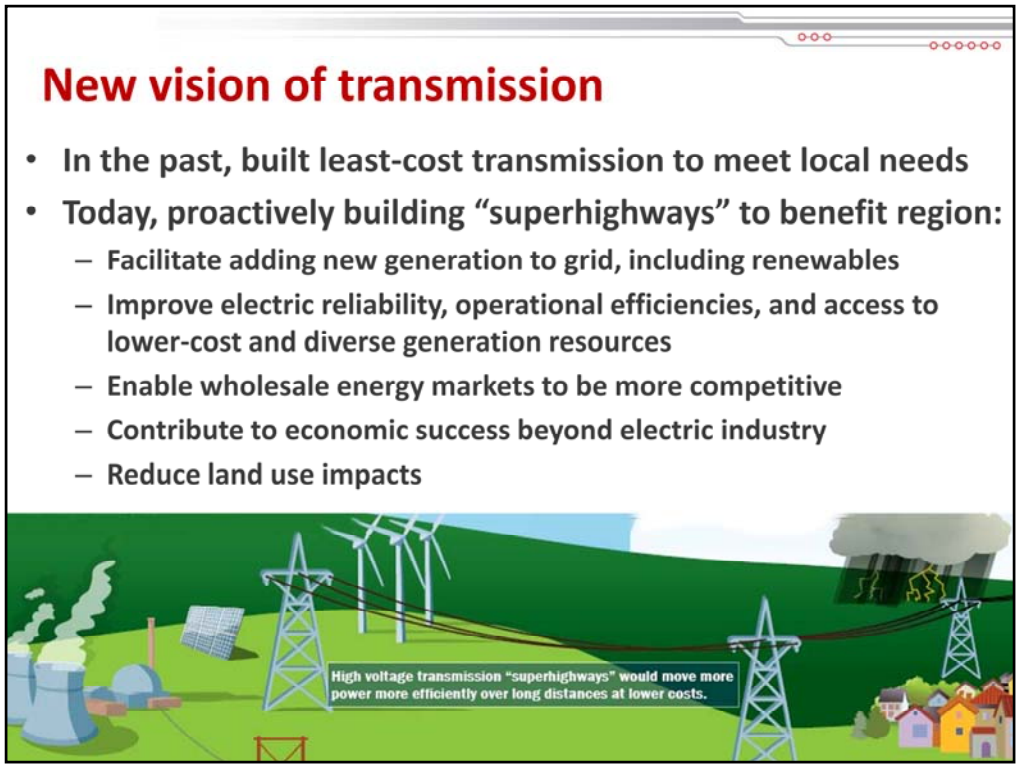


Transmission costs comprise only about 10 percent of U.S. electricity retail rates; generation costs comprise ~60% of rates, and distribution ~30%.* Today our smallest investment in electricity infrastructure is constraining our largest investment. We need strategic, appropriately-placed transmission to deliver the output of the capital-intensive generation to where it is needed across the region.

Transmission is the mechanism that enables optimal use of our region's diverse generating resources, including coal, natural gas, hydroelectric, nuclear, and the vast potential for wind energy.

Transmission enables our region's ability to minimize environmental impacts, to comply with federal and/or state public policy directives (such as Renewable Portfolio Standards), and to make the best use of our regional differences in generation resources and temperatures.

** 2010 EIA Annual Energy Outlook, Figure 60 on page 66 and Understanding Utility Cost Drivers, The Brattle Group*



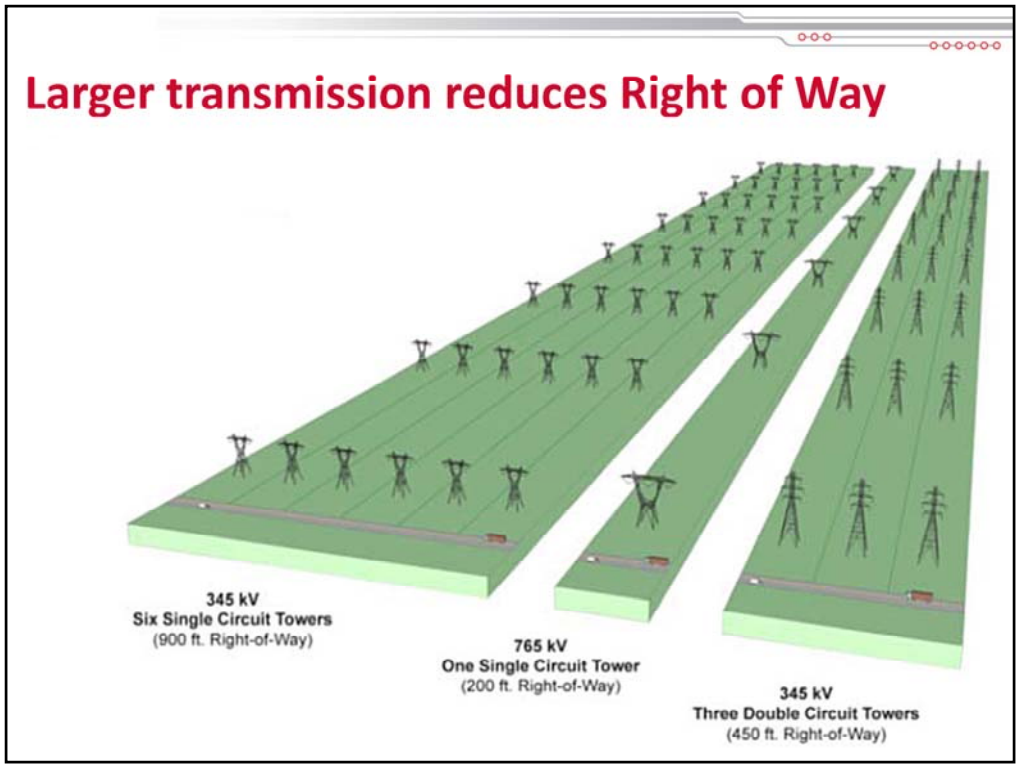
Traditionally, we have built transmission infrastructure in a reactive way – building just enough least-cost transmission to keep the lights on at the local level. We forecast future demand, planned generation to meet that demand plus reserves, then provided the least-cost transmission that minimally meets electric reliability standards.

Our members are now shifting to a new vision of enabling transmission. We want to proactively build a cost-effective, robust "transmission superhighway" that will benefit customers not just of one utility, but across the entire region.

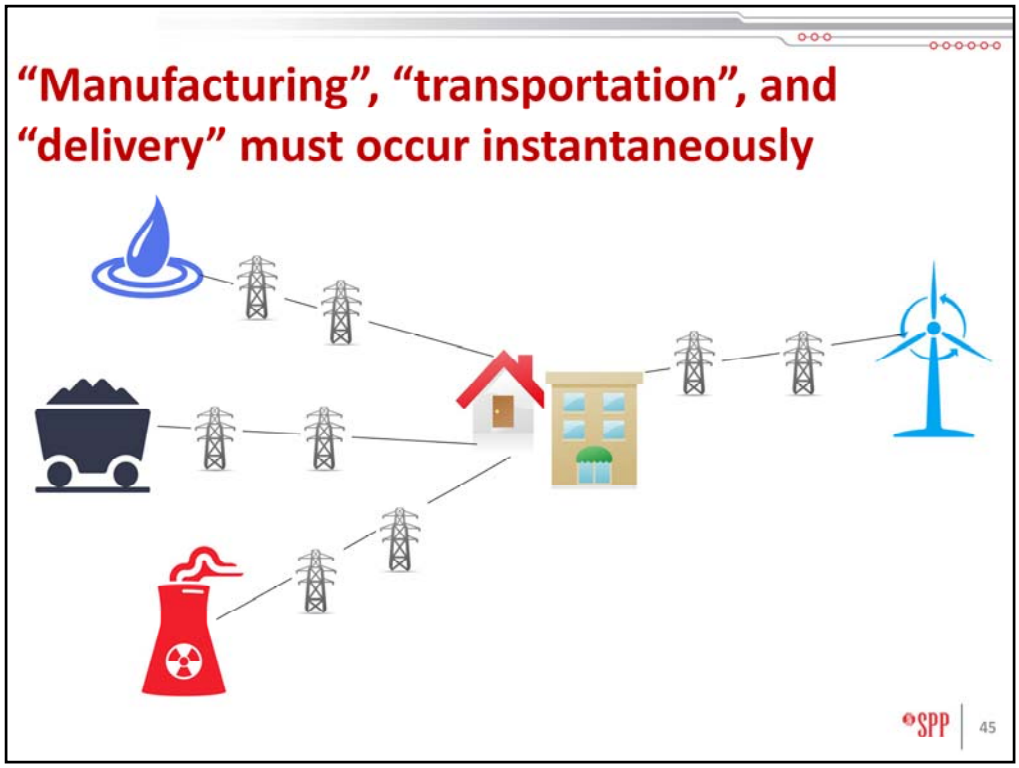
SPP analyses demonstrated that large-scale, extra high voltage "highways" provide benefits across a wider region than lower-voltage "byways".

Benefits of added transmission include:

- Improving electric grid reliability, making it better able to withstand disruptions including those associated with storms;
- More transmission means more lower-cost energy is accessible in the wholesale market, enabling SPP's current and future energy markets to be more competitive and robust;
- Possibly reducing amounts of energy that must be held in reserve for emergencies, allowing more generation into the wholesale energy market;
- Reducing land use impacts by anticipating future needs and building one large line rather than incrementally building several smaller lines;
- Investment in infrastructure contributes to economic success beyond the electric industry;
- More transmission means more efficient use of existing generation – which will improve utilization of the existing fleet and may even reduce the need for new generation;
- Facilitating adding new generation to the grid, including renewable energy, in a more cost-effective manner. Added renewable energy may contribute to a reduction in carbon emissions; and
- Improving operational efficiencies. Larger transmission delivers more energy with fewer losses and improves dynamic performance and system security.



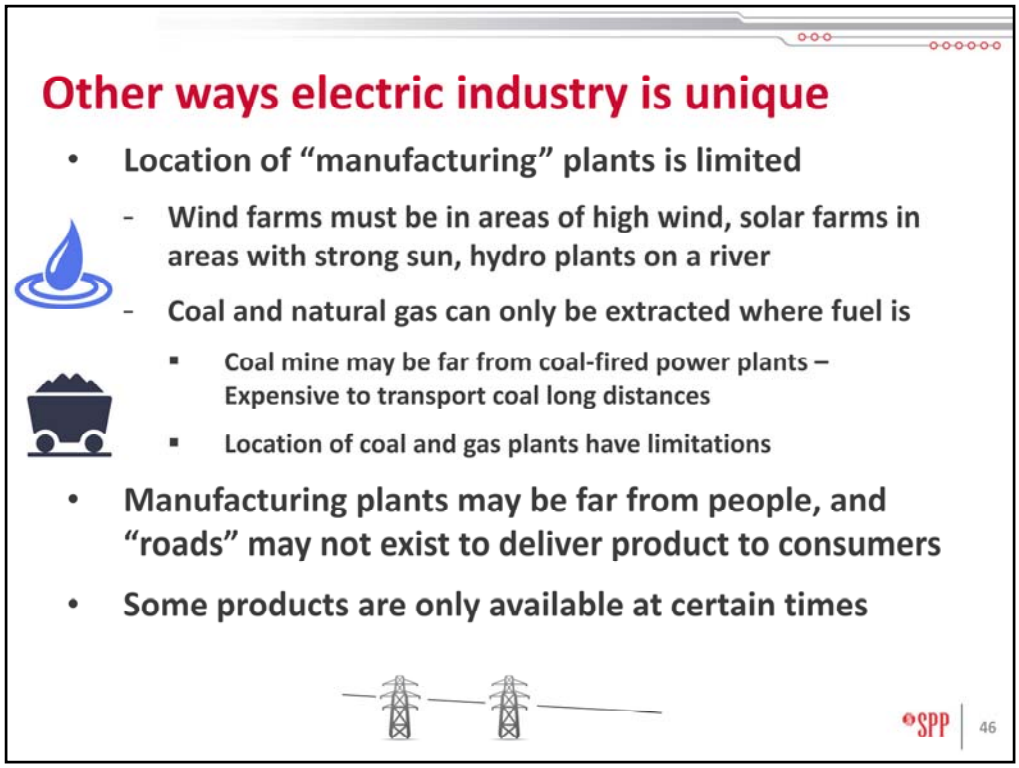
Building one large line uses less land than several smaller lines.



The electricity utility business is unique in many ways compared to other businesses. Electricity cannot be stored (at least in large quantities in the SPP region). In other industries you can manufacture your product, store it, and sell it as needed.

Electricity must be consumed as it is generated. When you turn on an appliance or flip a switch, a generator has to immediately meet your demand for electricity.

Depicted here are a number of types of generating resources – coal, wind, solar, natural gas, nuclear, hydro. However, all of these sources aren't always available. If the wind isn't blowing, or if a coal plant is down for maintenance, another type of generation must be immediately available to meet the demand.

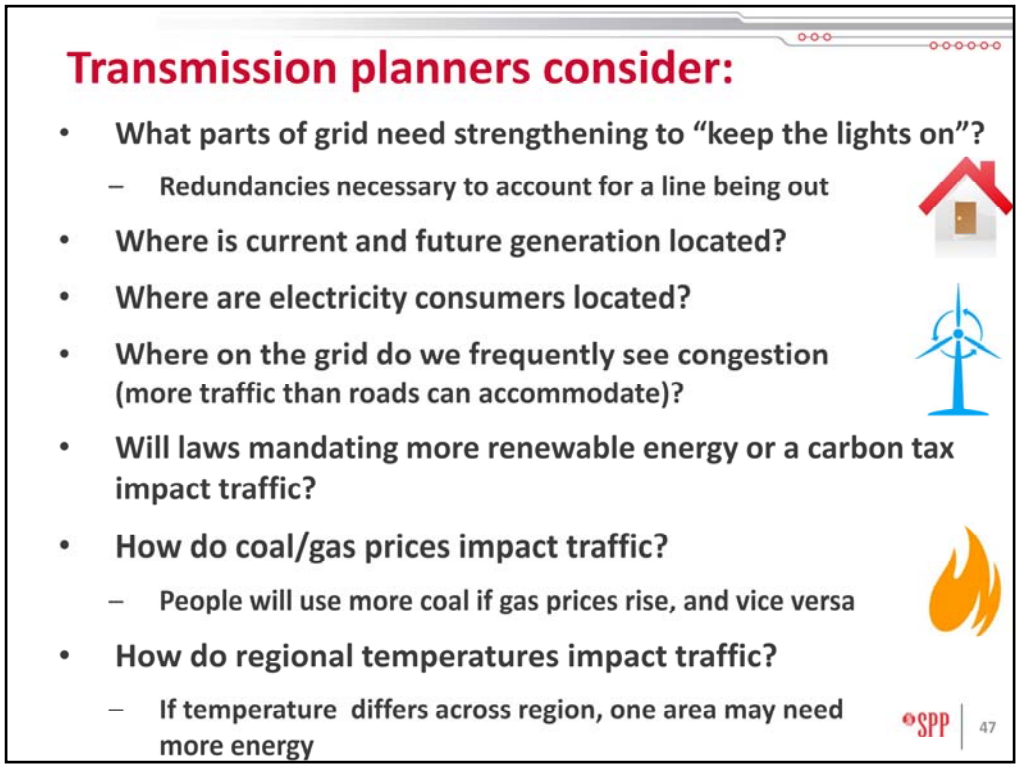


With most businesses, you could build your manufacturing plant anywhere. You would probably choose a location close to an interstate or railroad so you could transport your product, and would want to locate close to your customers. For instance, you might choose to be located in a shopping center.

The location of "manufacturing plants" for electricity is limited. 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.



SPP's transmission planners have to consider many factors.

Where do people want to build new generation plants? Transmission must be built to connect that generation to the grid.

Where is the demand for electricity? Is it growing or shrinking in certain areas? For instance, thousands of new electric cars would impact grid operations.

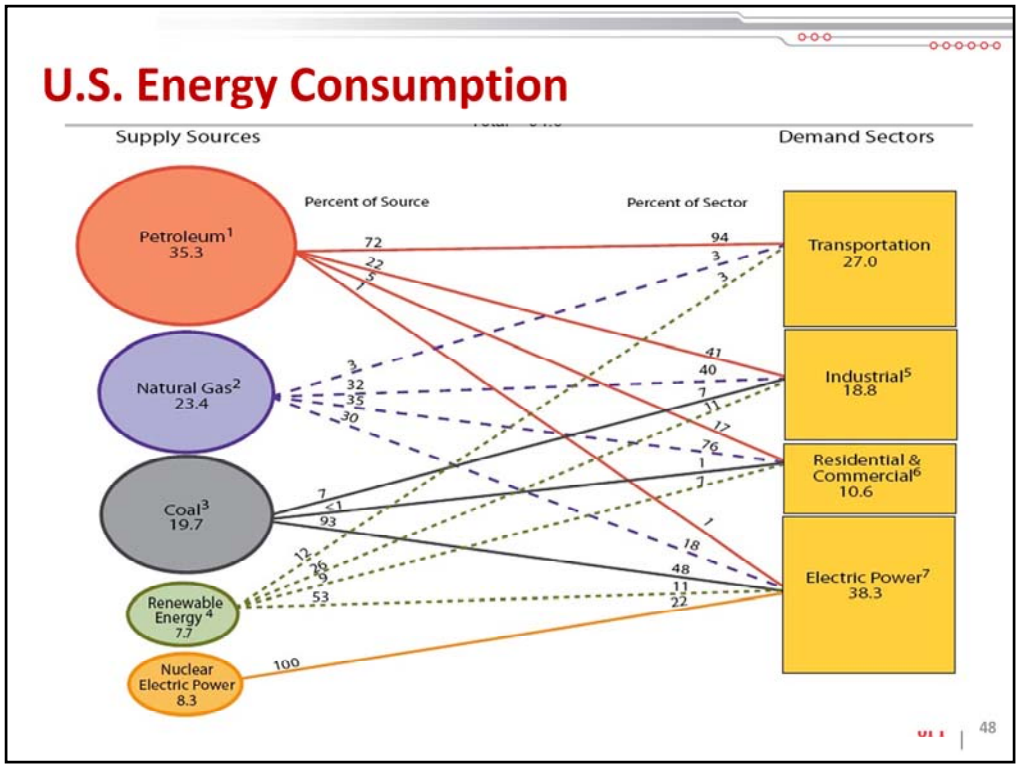
There are certain times and places when the electric grid is often blocked and congested because of too much traffic. What new transmission would solve these traffic blockages?

If the federal government passed a law requiring that a certain amount of energy must come from renewable sources, we would need to connect more renewable energy to the grid. We would need new roads to move that renewable energy to places that can't manufacture it themselves.

If the government put a tax on carbon, coal use might decrease and natural gas increase. This would change SPP's usual north-south traffic flow. In our region there is a lot of inexpensive coal-fired electricity in the north, due to coal mines in Wyoming. A lot of customers in the southern part of SPP buy this coal power.

Since it's hotter in the south than the north, the southern part of the region often needs more power than the northern part to run air conditioning units. In winter, an unusually cold snap in the south will cause a spike in electric heating use.

The southern part of the region has more natural gas. If coal prices went up, we could begin moving more natural gas electricity from the south to the north.



This chart depicts the types of energy used in the US, and how it's used. 40% of the nation's energy consumption is used to produce electricity.

According to SPP President and CEO Nick Brown, "We need a broad portfolio of generation options to meet growing demand and reduce emissions. We need to build more transmission – a low-risk investment which will enable us to move our capital-intensive generation to where it is needed. If we invest in more strategic, enabling transmission, it will allow us to make the best use of our region's diverse generating resources. Expanding the transmission grid will also allow us the flexibility to better manage many uncertain future scenarios such as carbon policy, varying fuel prices, growth in electricity demand, and state or federal policy goals."

http://www.eia.doe.gov/aer/pdf/pecss_diagram_2009.pdf, **Primary Energy Flow by Source and Sector, 2009**

What is congestion?

- Congestion or "bottlenecks" happen when you can't get energy to customers along a certain path
  - Desired electricity flows exceed physical capability
- Congestion caused by:
  - Lack of transmission, often due to load growth
  - Line and generator maintenance outages
  - Unplanned outages such as storms or trees on lines
  - Too much generation pushed to grid in a particular location
  - Preferred energy source located far from customers
- Results in inability to use least-cost electricity to meet demand

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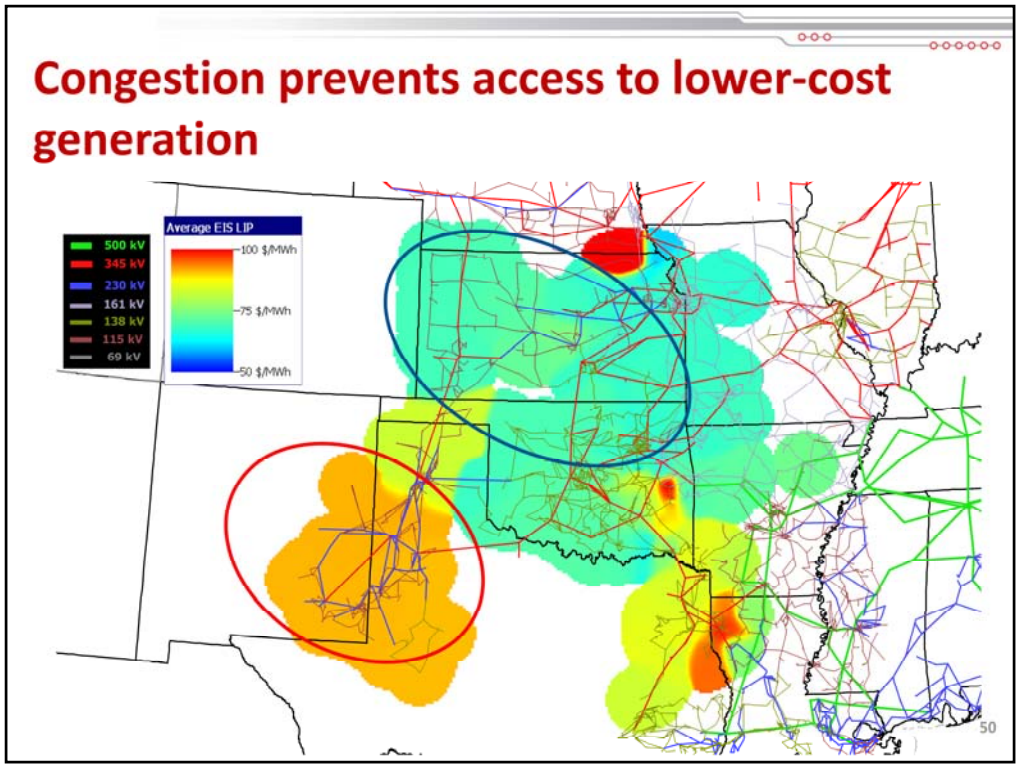
There are specific times and places in the SPP region where least-cost energy can't be delivered to customers. Grid congestion or "bottlenecks" happen when you can't get energy to customers along a certain path. Congestion may be caused by heavy usage of specific segments of the grid or unplanned situations such as storms, lack of transmission lines (demand may have grown faster than transmission was built), or by the preferred energy source being located far away from customers.

Similar to how traffic gets congested if there aren't enough lanes in the highway – the electric grid gets congested if there aren't enough transmission lines.

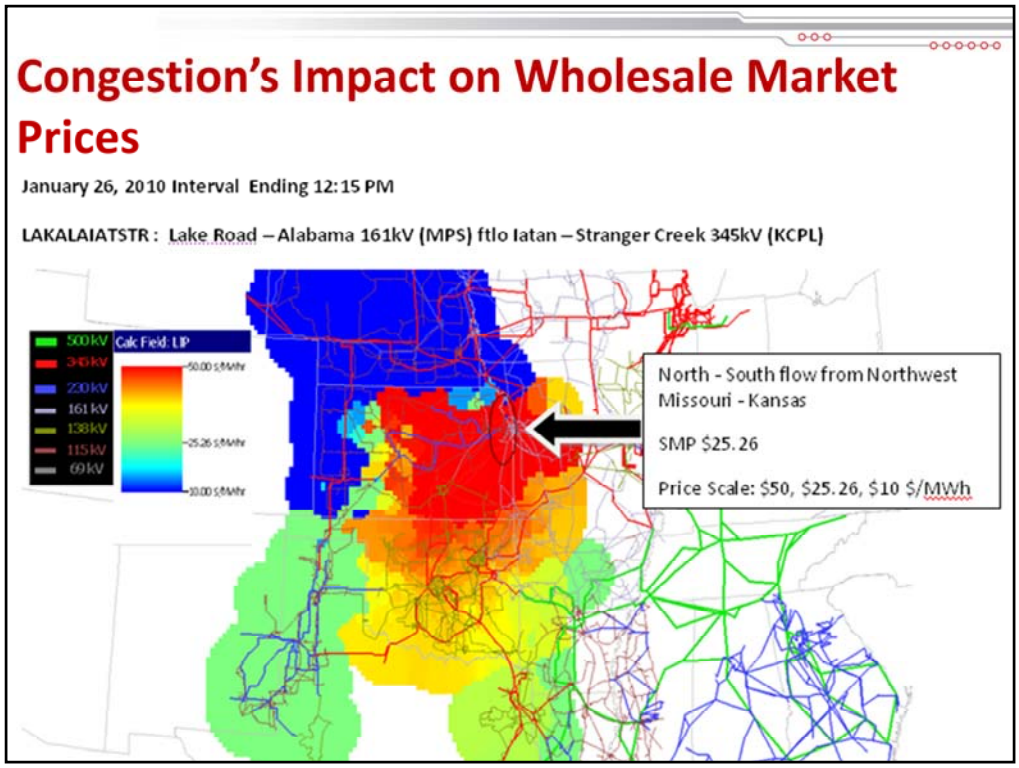
More electricity "highways" will improve electric reliability and allow us to move more power more efficiently. If customers can't access lower-cost generation due to lack of transmission lines, they may have to pay higher electricity costs.



Relieving grid congestion will reduce production costs across the region. For example, a utility could have two generators – one at $30/megawatt hour and one at $50/megawatt hour. If there isn't enough transmission available, the utility may have to reduce production at the $30 plant and use the $50 plant instead. This means less $30 generation is available to customers. More transmission will make SPP's wholesale electricity market prices more consistent across the region.

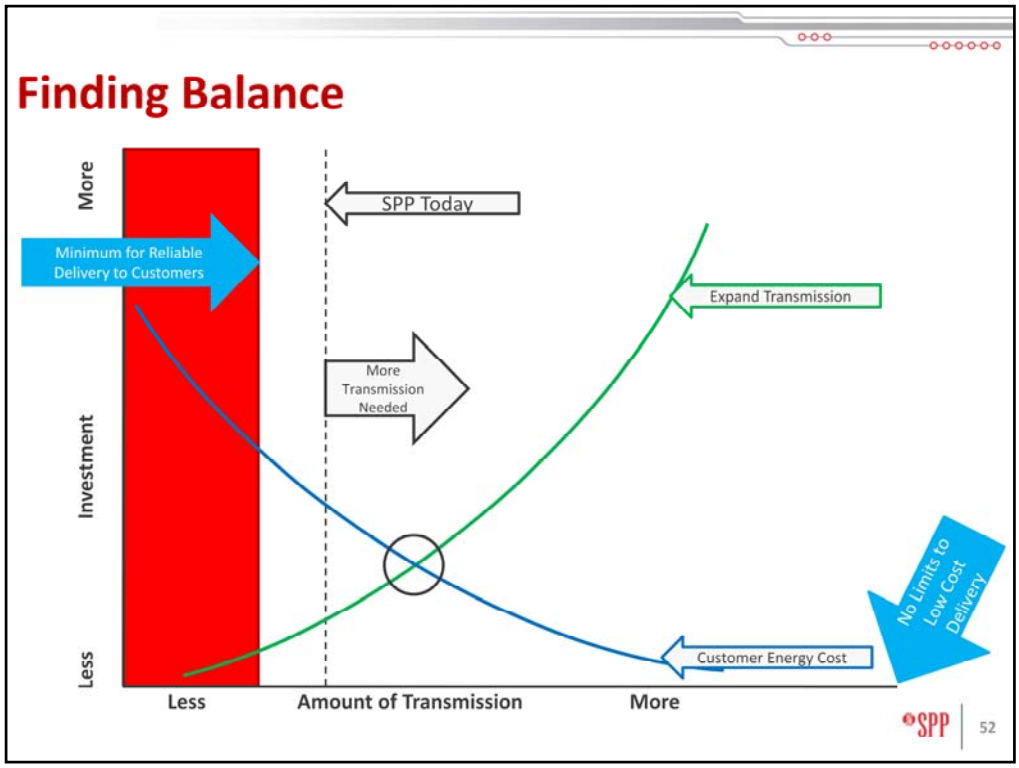
The blue and green colors indicate areas with little congestion and less expensive energy, while the orange and red colors indicate congested areas with more expensive energy. The transmission system is unable to deliver lower-cost electricity to the congested areas. The less-expensive generation in the center of the region cannot flow to the southwest, resulting in prices that are different by $20.

See a real-time congestion map on SPP.org > Market Info > LIP Contour Map.

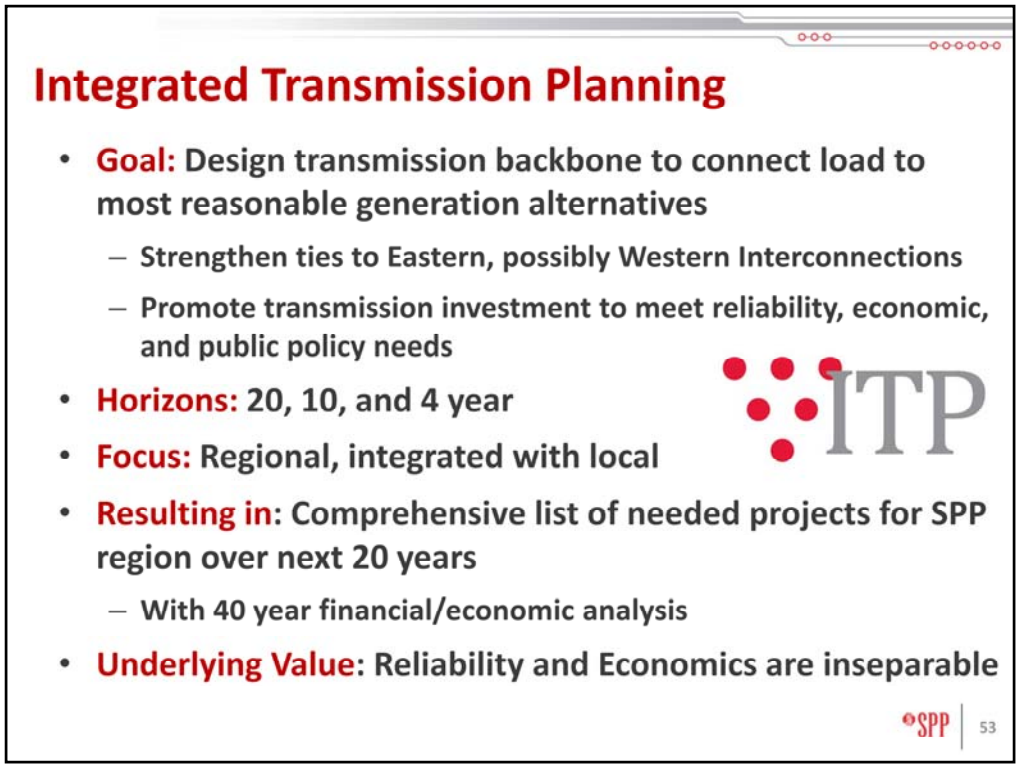


Transmission has significant impact on SPP's wholesale electricity market prices. On the day depicted on this map, congestion on a specific grid point (where the arrow is) triggered significant price separation in SPP. Absent this congestion event, the price at all locations would have been $25.26/MWh.

Added transmission will help resolve these congested areas and make prices more consistent across the region.

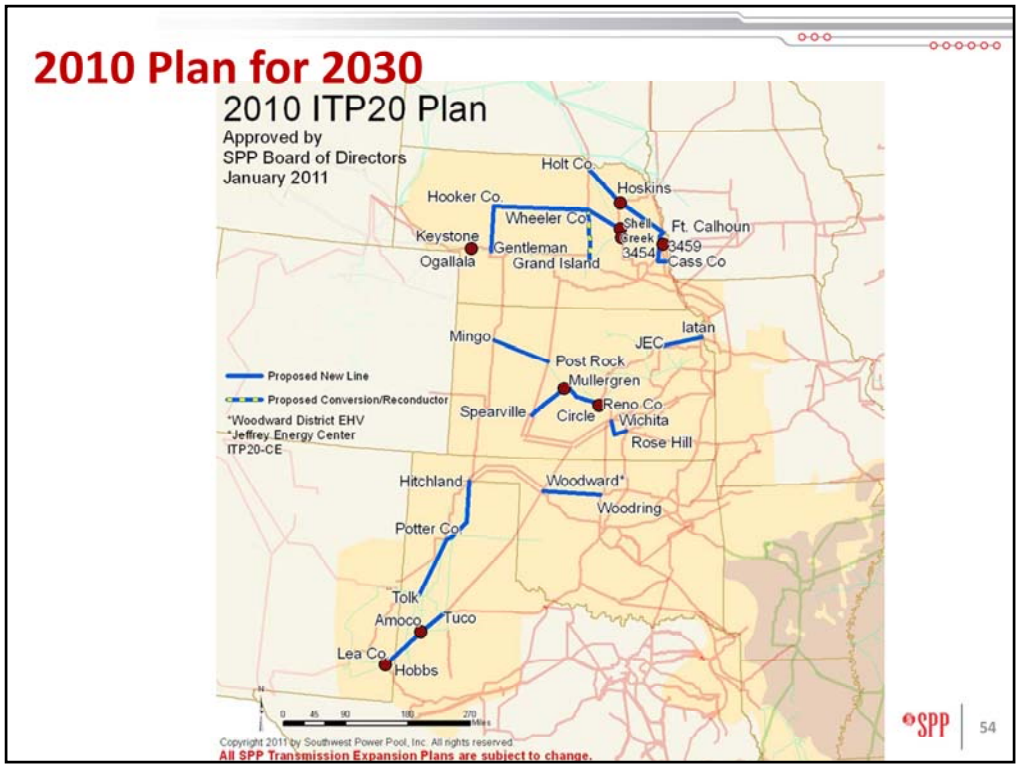


Our goal is to achieve an optimum balance between long-term transmission investment and congestion costs. As appropriate investments in new transmission are made, the amount of congestion costs to which customers are exposed decreases.



One of SPP's responsibilities as a Regional Transmission Organization is to create regional transmission expansion plans. SPP doesn't build transmission, though our Open Access Transmission Tariff contains rules that govern transmission planning. We work with our members to create planning models and studies to determine what new transmission will be needed to maintain reliability and provide economic benefit into the future. Rather than looking at the needs of just one member, we assess needs from a larger, regional perspective. What new transmission infrastructure would provide the most benefit to the most members?

Approved by FERC in 2010, SPP's new Integrated Transmission Planning (ITP) process consists of 20-Year, 10-Year, and Near-Term Assessments. The first iteration of the ITP was a 20-Year Assessment completed in January 2011. The first 10-Year Assessment will be performed in 2011, with results presented in January 2012. Near Term Assessments will be conducted every year.



In January 2011 SPP completed its first ITP 20-Year Assessment (ITP20), which identified grid upgrades projected to be needed by 2030 to accommodate possible future scenarios and provide a strong transmission grid. The 2010 ITP20 developed several transmission project portfolios and evaluated them on a number of metrics. The SPP Board of Directors selected a portfolio of transmission projects that will

provide the much needed "roadmap" for transmission expansion in the SPP region and guide future planning efforts and specific project needs.

The 2010 ITP20 Plan consists of 1,494 miles of 345 kV lines and 11 345 kV step-down transformers. The projects are estimated to bring benefits more than five times greater than the $1.8 billion engineering and construction cost by reducing members'' costs to generate and supply energy to customers.

Qualitative benefits include: providing the foundation for higher renewable energy levels, increasing competition and levelizing prices in SPP's energy markets by providing access to more generation, increasing system reliability and efficiency, strengthening the ability to transport energy from/to other regions, reducing emissions, and using land responsibly.

SPP is not asking utilities to build the ITP20 projects at this time. The ITP20 provides a vision for the year 2030. Knowing where we are going will help us in our shorter-term planning as we determine the transmission infrastructure needed to interconnect new generation to the grid and meet our members' requests for long-term use of the region's transmission lines. These 2010 ITP20 projects will continue to be reviewed in future studies."

Other Transmission Planning

- Generation Interconnection Studies
  - Determines what transmission is needed to connect new generation to grid
  - Doesn't include transmission service
- Aggregate Studies
  - Determines what transmission is needed meet requests for transmission service
  - Shares costs of studies and new transmission

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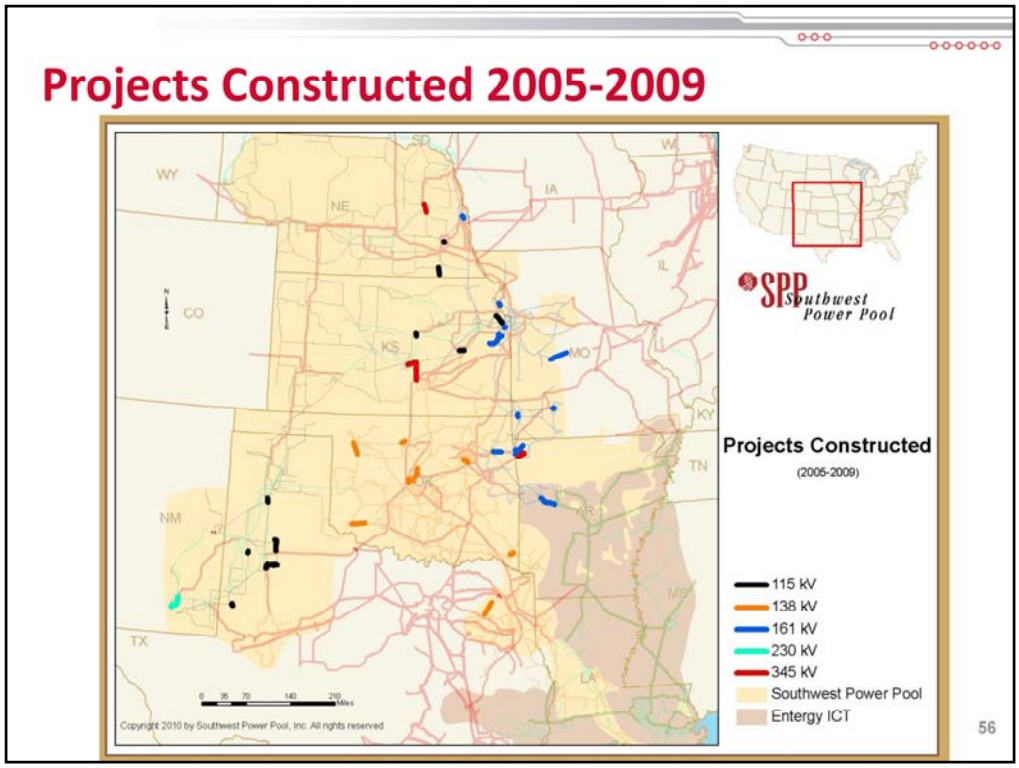
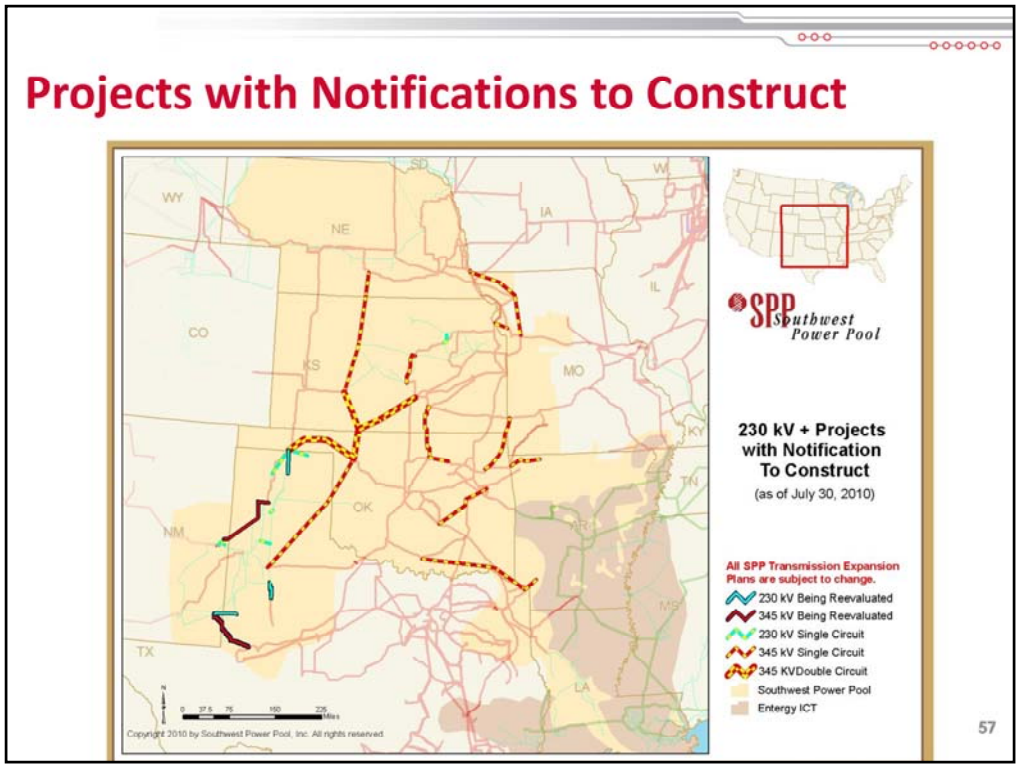
Any new generation - fossil fuel or renewable- has to go through SPP's generation interconnection process to be added to the transmission grid. The generation interconnection queue represents customers' requests for SPP to study what new transmission is needed to connect new generation to the electric grid.

SPP conducts aggregate studies to help customers determine what transmission upgrades may be needed to meet requests for long-term transmission service. Rather than studying just one request at a time, SPP aggregates transmission service requests entered during an "open season" and generates one report for all requested projects.



This map depicts projects constructed 2005-2009.



This map depicts projects for which SPP has notified Transmission Owners to begin the construction process.

Balanced Portfolio

- Economic transmission upgrades (cost) to lower generation production costs (benefit)
- Balance costs and benefits in each zone
- Transmission expansion costs shared regionally

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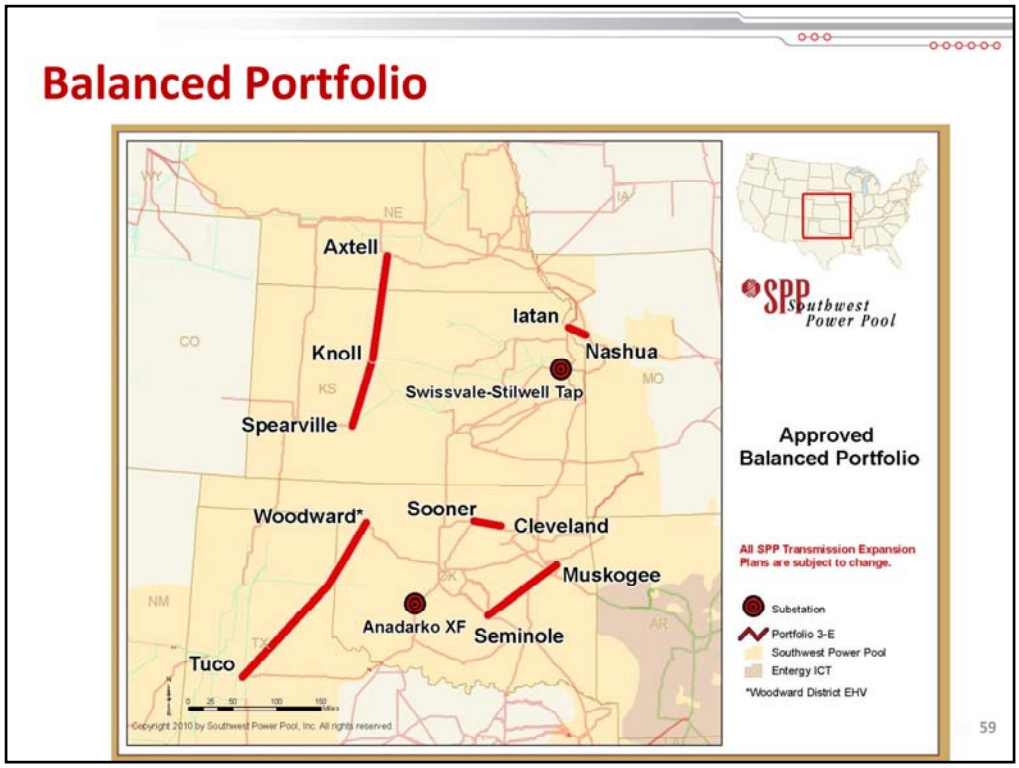
The Balanced Portfolio is a set of projects that was approved by the SPP Board of Directors in April 2009. These economic transmission expansion upgrade projects total over $700 million and are funded by the application of FERC-approved rates to SPP's transmission-owning members across the region. The benefits of this group of transmission upgrades have been demonstrated by model analysis to outweigh the allocated costs, thus achieving a "balanced portfolio" of projects. The overall cost of energy to serve SPP's load should be reduced by an amount exceeding investment in the grid. This portfolio of projects will also reduce congestion on the SPP transmission system and provide other benefits such as increased reliability and lower end-use consumer costs.



The Balanced Portfolio includes five new 345 kV transmission lines, a 345 kV transformer, and a new connection between two existing 345 kV lines. Out of over 50 transmission projects analyzed by SPP, the following projects met specific requirements of the SPP Open Access Transmission Tariff for achieving regional benefits greater than costs. (The models determined cost/benefits based on simulated production cost requirements among utilities in SPP's footprint.) The projects will be funded by the application of FERC-approved "postage stamp" rates to SPP's transmission-owning members across the region.

-250 mile "Woodward -Tuco" line between Hale County, Texas (north of Abernathy) and Woodward, Oklahoma
-215 mile "Spearville-Knoll-Axtell" line between Spearville, Kansas (east of Dodge City); Hays County, Kansas; and Axtell, Nebraska
-100 mile "Seminole-Muskogee" line between Seminole County and Muskogee, Oklahoma
-36 mile "Sooner-Cleveland" line between Sooner Lake in Noble County, Oklahoma and Cleveland, Oklahoma
-30 mile "Iatan-Nashua" line between Iatan and Nashua, Missouri (north of Kansas City)
-Anadarko Transformer in Anadarko, Oklahoma
-Swissvale-Stilwell Tap near Gardner, Kansas

Priority Projects

- Benefit/cost ratio = 1.58
- Previously identified in SPP planning studies
- Relieve grid congestion
- Improve SPP members' ability to deliver power to customers (by improving Aggregate Study process)
- Improve transfers between SPP's east and west regions
- Facilitate adding new generation to the grid (by improving Generation Interconnection process)

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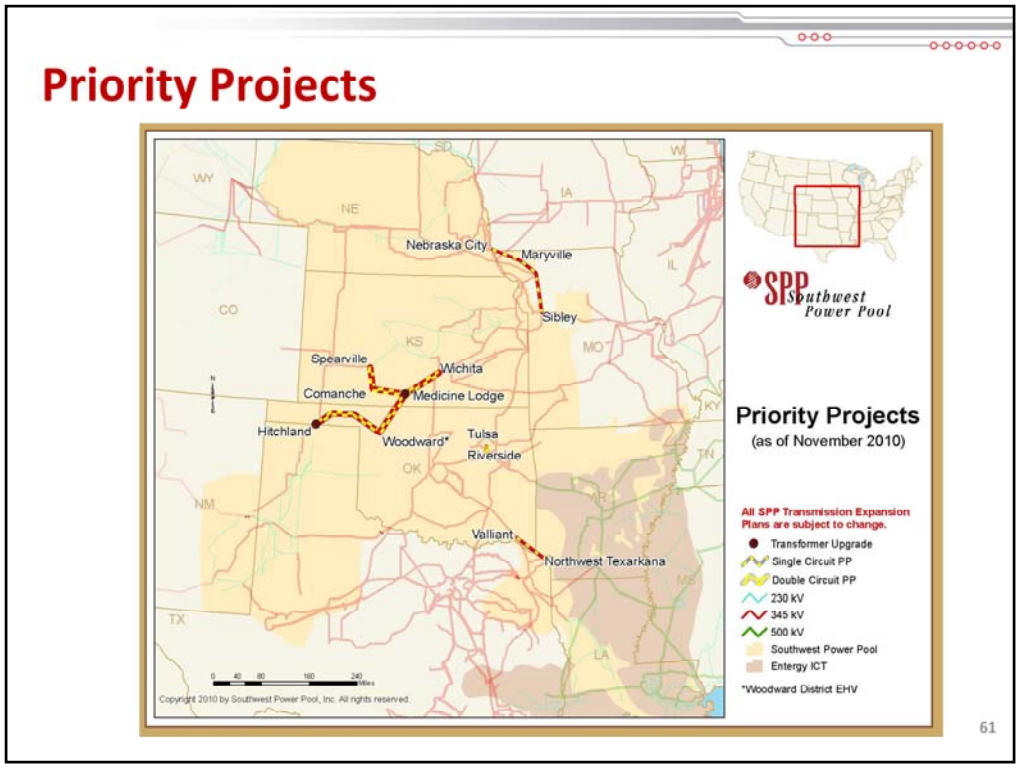
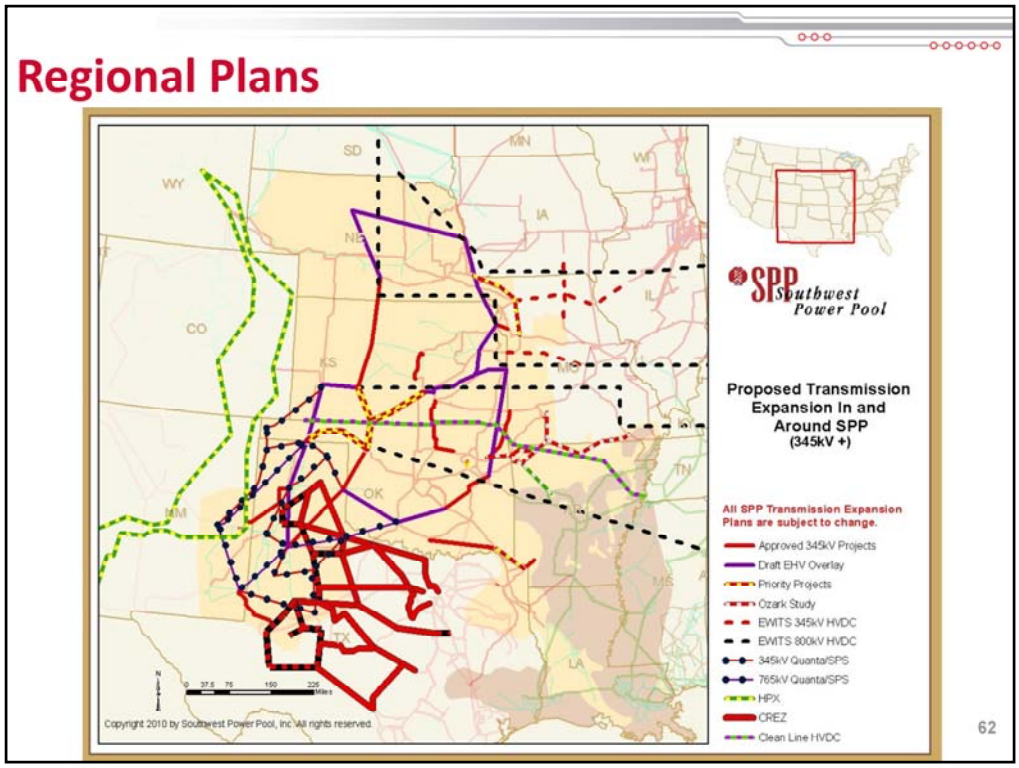
Priority Projects are a set of economic upgrades that meet transmission planning objectives of the Synergistic Planning Project Team, a high-level policy team consisting of state regulators and SPP member representatives.



This map depicts Priority Projects that were approved for construction by the SPP Board of Directors. Project costs are assigned to SPP's transmission owning members per the Highway/Byway cost allocation methodology.

- Double-circuit 345-kV line from Spearville, Kansas; to Comanche County, Kansas; to Medicine Lodge, Kansas; to Wichita, Kansas
- Double-circuit 345-kV line from Medicine Lodge, Kansas, to Woodward, Oklahoma*
- Double-circuit 345-kV line from Woodward, Oklahoma to Hitchland, Texas
- 345-kV line from Nebraska City, Nebraska; to Maryville, Missouri; to Sibley, Missouri
- 345-kV line from Valliant, Oklahoma to Texarkana, Texas
- New equipment in Tulsa County, Oklahoma

**This line was originally planned to be built from Comanche County, Kansas to Woodward, Oklahoma. This line modification was approved by SPP's Board of Directors in October 2010.*



This map show how SPP transmission expansion plans (Priority Projects, EHV Overlay, Balanced Portfolio) could connect to other regional transmission projects that are being planned, including expansion plans from Clean Line Energy, Southwestern Public Service, High Plains Express, Tres Amigas, and the Competitive Renewable Energy Zones build-out in Texas. Interregional coordination is needed, and SPP supports federal leadership on interregional planning and cost allocation.

Regional State Committee

- Retail regulatory commissioners:

Arkansas	Nebraska	Oklahoma
Kansas	New Mexico	Texas
Missouri		

Louisiana maintains active observer status

- Functions
  - Cost allocation
  - Ensure adequate supply
  - Market cost/benefit analyses

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SPP's regional state committee is comprised of regulatory commissioners from our member states. They work hard to solve regional issues - especially cost allocation issues. Who will pay for new transmission? They are also responsible for ensuring an adequate supply of generation and for conducting cost-benefit analyses for new energy markets.

Who pays for transmission?

Type	Reliability "Base Plan Funding"	Economic "Balanced Portfolio"	Sponsored	Highway/ Byway
Funded	33% / 67%	"Postage Stamp" for 345 kV projects with balancing transfers	Directly assigned w/ revenue credits	Postage Stamp
Reason	Criteria or Designated Resource	Aggregate and Individual Transmission Owner Benefits / Cost ≥ 1	Sponsor(s) nominate projects	ITP projects
Voltage	Transmission	345 kV and above		
Effective	2005	2008	2009	2010

Highway/Byway

Voltage	Paid for by Region	Paid for by Local Zone
300 kV and above	100%	0%
above 100 kV and below 300 kV	33%	67%
100 kV and below	0%	100%

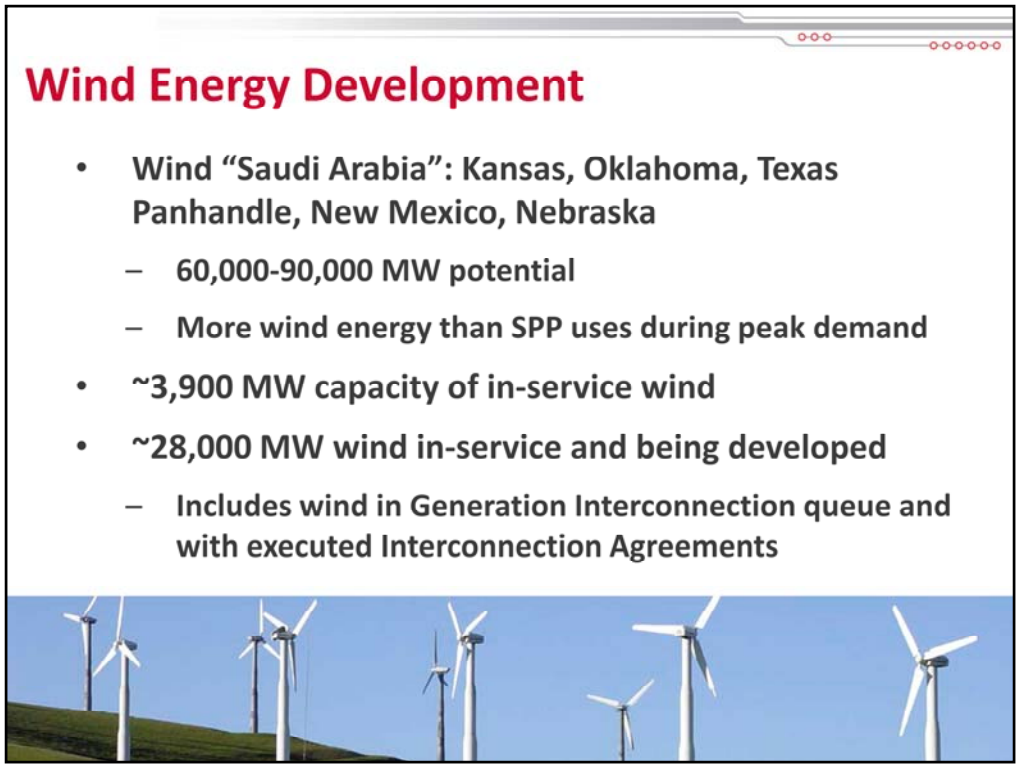
In June 2010 FERC approved a new "Highway/Byway" method of sharing costs for new electric transmission in the SPP region. This approach, which assigns costs of high-voltage transmission regionally and lower-voltage locally, will help SPP and its members build a stronger transmission grid that will benefit the entire region.

SPP analyses demonstrated that large-scale, extra high voltage "highways" provide benefits across a wider region; thus, costs will be assigned to electric utilities across the SPP footprint. Lower-voltage "byways" benefit smaller areas within the region; a formula will be used to assign costs more directly to the utility in whose service territory (zone) the project is located and that will receive the most benefit from the project. Highway/Byway cost allocation applies to transmission expansion projects approved by the SPP Board of Directors after June 19, 2010.

Highway/Byway is the result of years of incremental work by our Regional State Committee to answer the question: who will pay for new transmission? In 2005 the RSC implemented cost sharing for projects needed to maintain reliability. For reliability projects approved 2005-2009, all SPP transmission owners pay 1/3 of the costs, and the most directly-impacted transmission owners that benefit from the project pay 2/3 of the costs.

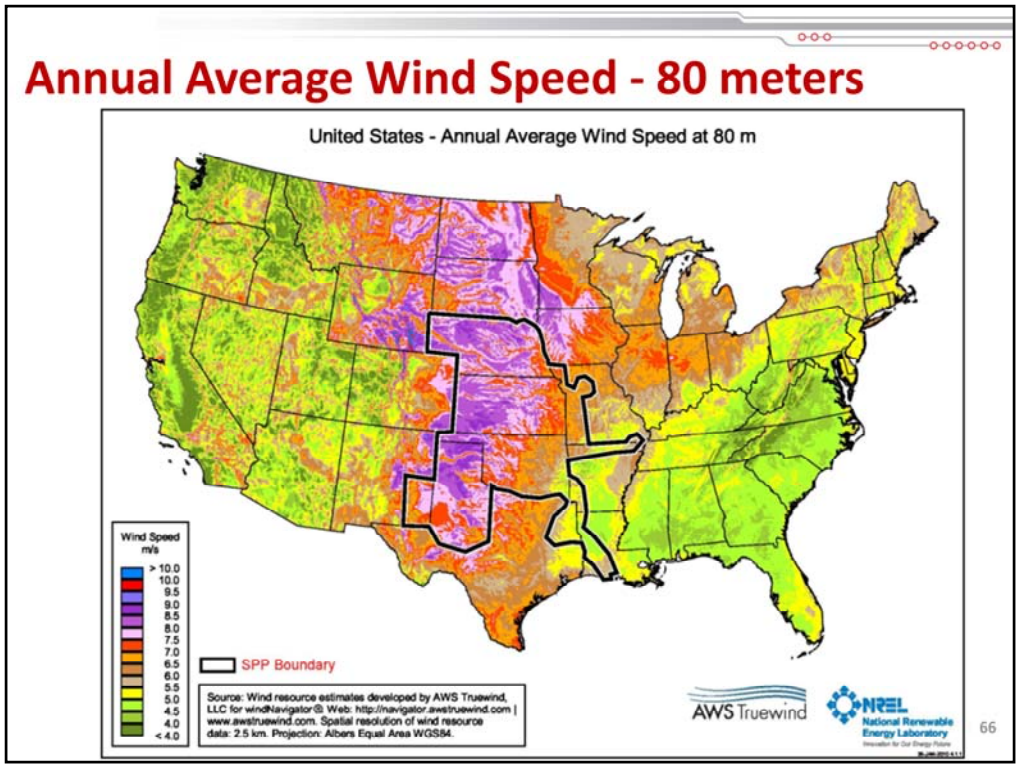
In 2009 the RSC created the Balanced Portfolio methodology, and the Board approved a set of Balanced Portfolio projects. Costs of the 345 kV+ projects in the Balanced Portfolio, expected to bring greater benefit than costs, will be shared regionally.

Any utility can propose a transmission expansion project. If the project will be connected to transmission facilities under the SPP Tariff, SPP needs to analyze the project's impact on reliability. If SPP determines there is no harm or that the harm can be remedied by additional transmission which the sponsor funds, then the project can proceed. However, that "sponsored" project isn't eligible for rate recovery via SPP mechanisms. The sponsor is provided revenue credits for subsequent transmission service SPP is able to sell because of the upgrades.

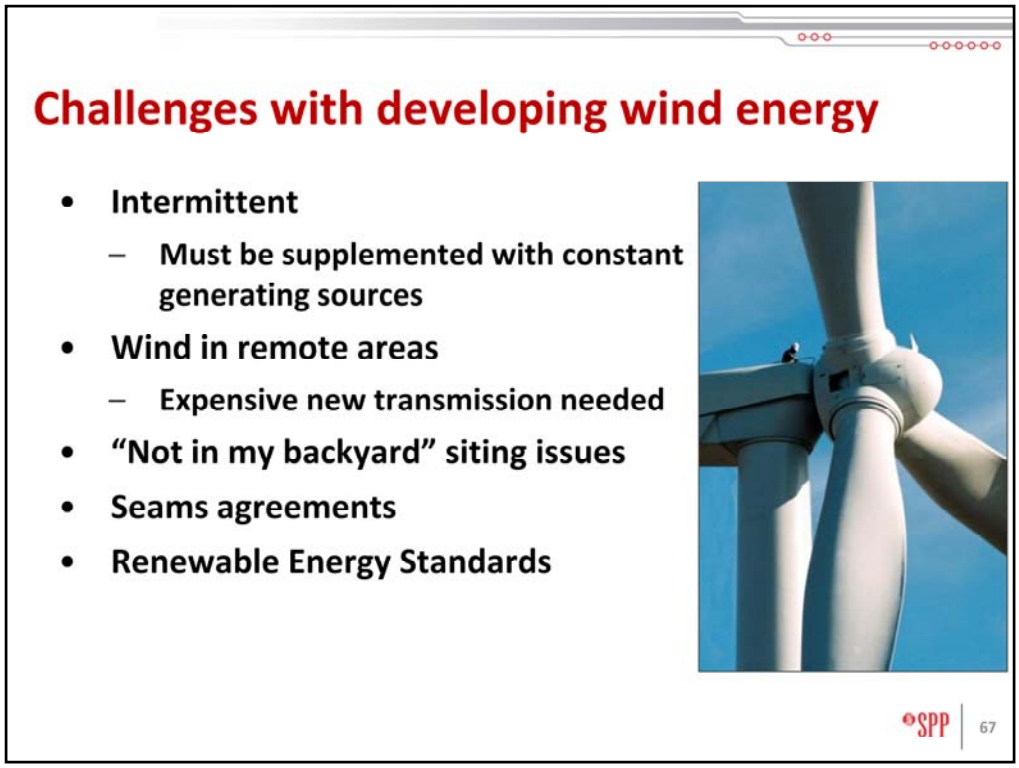


The SPP region is rich in wind resources. There is more potential wind energy in the footprint than SPP could absorb. We have over 28,000 MW of wind in-service and under development in the RTO generation interconnection queue, waiting to be added to the grid. Compare this to SPP's 2010 system peak on the hottest summer day of ~53,000 MW. Projections in the National Renewable Energy Lab/Department of Energy's Eastern Wind Integration and Transmission Study (EWITS) forecasts 60 – 95 GW of wind development in SPP.

NOTE: We do not have a way to track wind that doesn't or hasn't gone through the SPP planning process - such as wind that predates different stages of our generation interconnection process and wind that is not SPP-jurisdictional (including distribution wind).



The SPP region is rich in wind energy resources.



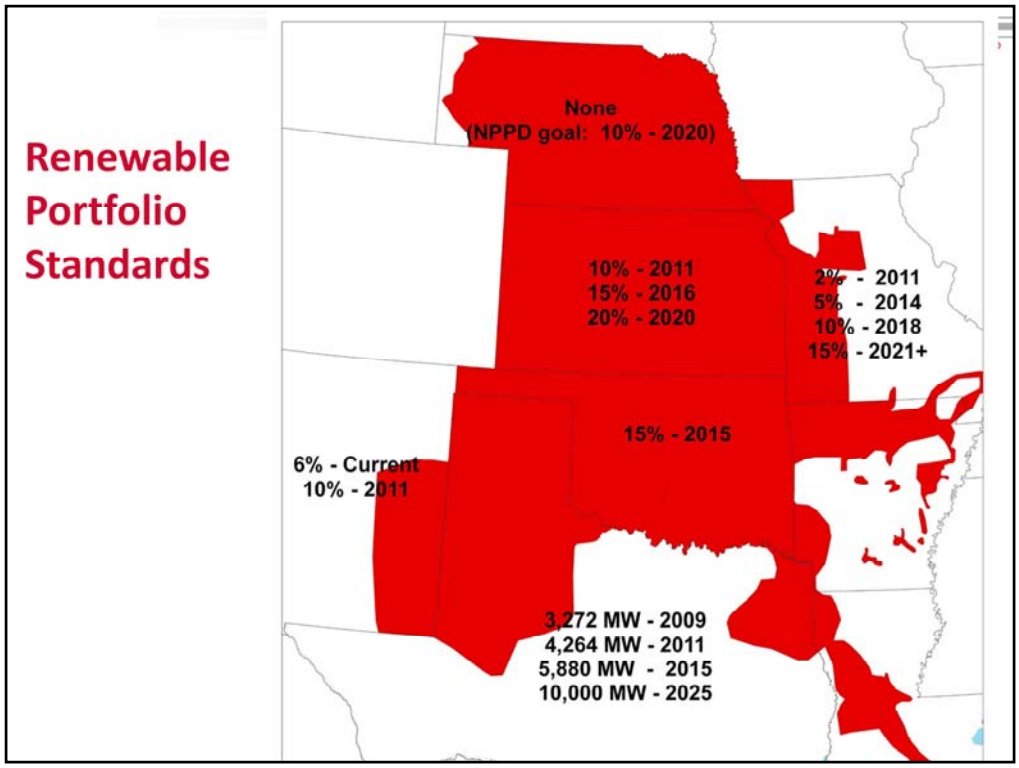
There are challenges with absorbing so much wind into the electric grid. Wind energy is intermittent. The wind may blow at one wind farm but not another, or may blow more strongly at night than during the day. To maintain reliability, wind energy needs to be supplemented with constant energy sources, such as coal, natural gas, or nuclear. A large marketplace such as SPP's is more friendly for integrating wind energy into the transmission grid, because it can accommodate intermittent generation.

Transmission construction is very expensive; the average cost for 765 kV is $2.6-$4 million per mile; 500 kV is $2.3-$3.5 million; 345 kV is $1.1-$2 million. Wind developers most often have to build in remote areas where there is little or no existing transmission.

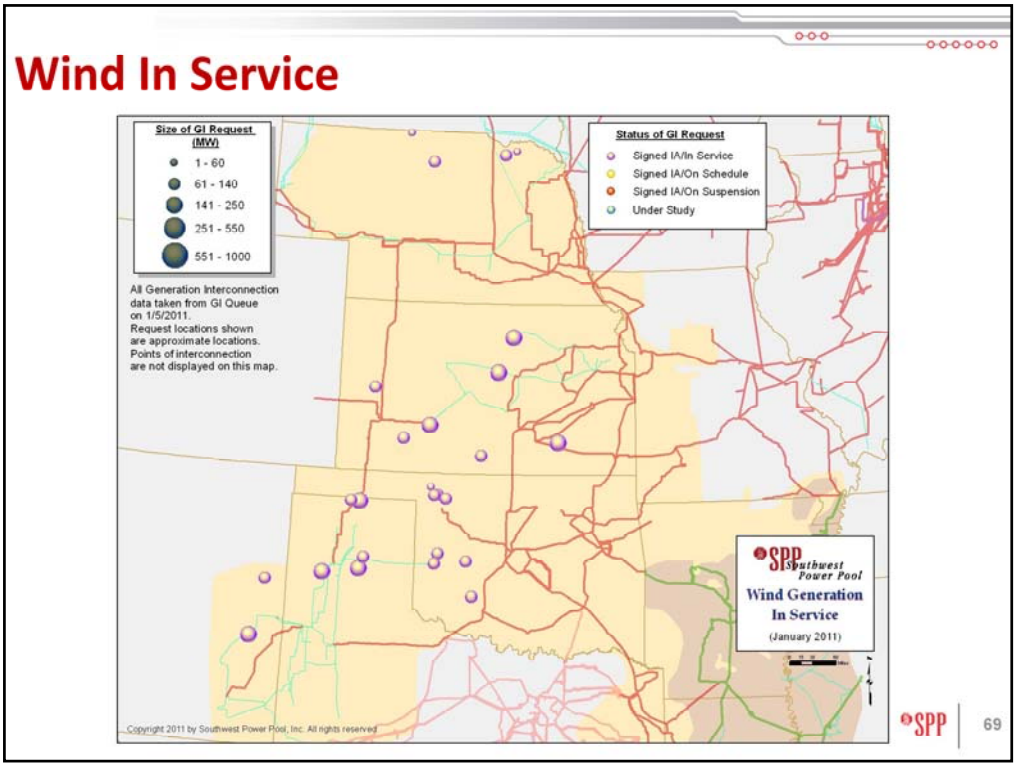
New wind generation and transmission faces the same "not in my backyard" issues as other types of generation. High voltage transmission lines require significant rights-of-way, which are sometimes challenged by environmental organizations and property owners. There are concerns about how wind farms coexist with wildlife and agriculture.

We need efficient and effective seams agreements, which determine how neighboring transmission providers interact at their borders. Seams agreements will be a critical step in the implementation of any major interregional transmission projects.

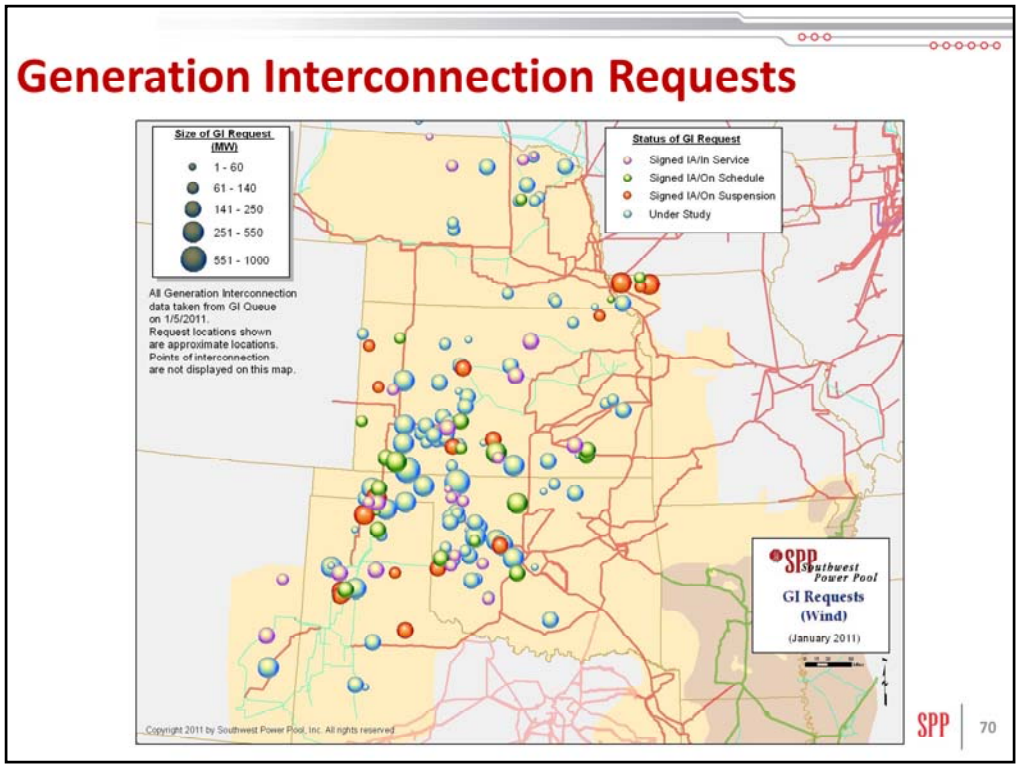
Renewable Energy Standards (also called Renewable Portfolio Standards) are governmental mandates that require a certain amount of energy to come from renewable resources. Some states have RPS, and there is discussion of federal RPS. These standards impact discussion on renewables. Those in "have not" states would have to import renewable energy from those with renewable resources.



Some states in the SPP footprint have passed standards requiring a certain amount of electricity to come from renewable sources by a deadline. If the federal government passed a renewable standard, the need would increase for the SPP region to export wind energy to other parts of the country.



This map depicts wind energy in service as of January 2011.



This slide depicts wind energy in the generation interconnection queue as of January 2011; there is great potential for new wind generation in the coming years.

Contract Services

- Alternative to RTO membership for Transmission Owners
- Oversight of Transmission Owners' system operations:
  - Reliability Coordination
  - Transmission Planning
  - Tariff Administration
  - Interregional Coordination
- Provides process for assigning cost responsibility for transmission upgrades

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We provide services on a contract basis to non-members.

SPP's Major Contracts

- Southwestern Power Administration
  - All RTO services except Transmission Expansion and EIS Market
- LG&E Independent Transmission Operator
  - Planning, Tariff Administration, OASIS hosting, Scheduling
- Entergy Independent Coordinator of Transmission
  - Planning, Reliability Coordination, Tariff Administration, and Weekly Procurement Process

How does SPP impact you?

- SPP cost = 37¢ of $100 residential utility bill

- Cost to typical residential customer for $1 billion incremental transmission is ~$1.34 per month
- 2005 independent analysis by Charles River Associates:
  - $500,000 cost-benefit study
  - On behalf of state regulatory commissions
  - 270% ROI for SPP services over the next 10 years

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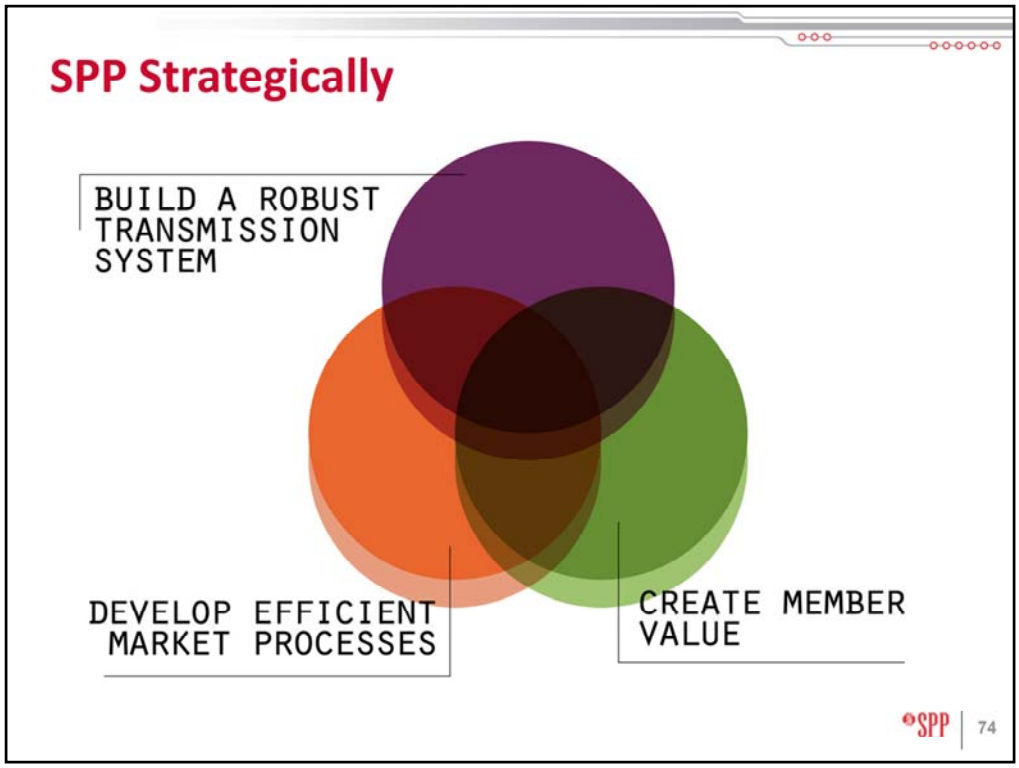
For most of our members, the retail portion of rates is subject to approval by state utility commissioners.



SPP's strategic plan may be downloaded from the *About Us* section of SPP.org. To continue to promote reliability excellence and meet our members' needs, the Strategic Planning Committee reassessed its 2008 Strategic Plan, positioning SPP to fulfill its mission statement over the next decade and beyond. The committee first established a baseline for where SPP is today, then reviewed alternative visions of how the industry may change over the next decade. Three foundational strategies and associated initiatives were developed to leverage SPP's capabilities and operational processes:

1. **Build a Robust Transmission System:**
Implement Priority Projects
Develop/Implement Integrated Transmission Planning Process
Regional Cost Recovery
Inter-Regional Optimization
Operational Optimization

2. **Develop Efficient Market Processes:**
Implement Day Ahead Market with Transmission Congestion Rights
Implement Reliability Unit Commitment Process
Incorporate Operating Reserves into Real Time Balancing and Day Ahead Markets
Implement Consolidated Balancing Authority
Demand Response Integration
Manage Implementation

3. **Create Member Value:**
Reliability Excellence
Benchmarking and Measurement
Enhance Market Monitoring Tools
Continuous Process Improvement
Strategic Membership Expansion
Communication and Education