



75

SEVENTY-FIVE YEARS OF
RELIABILITY THROUGH RELATIONSHIPS



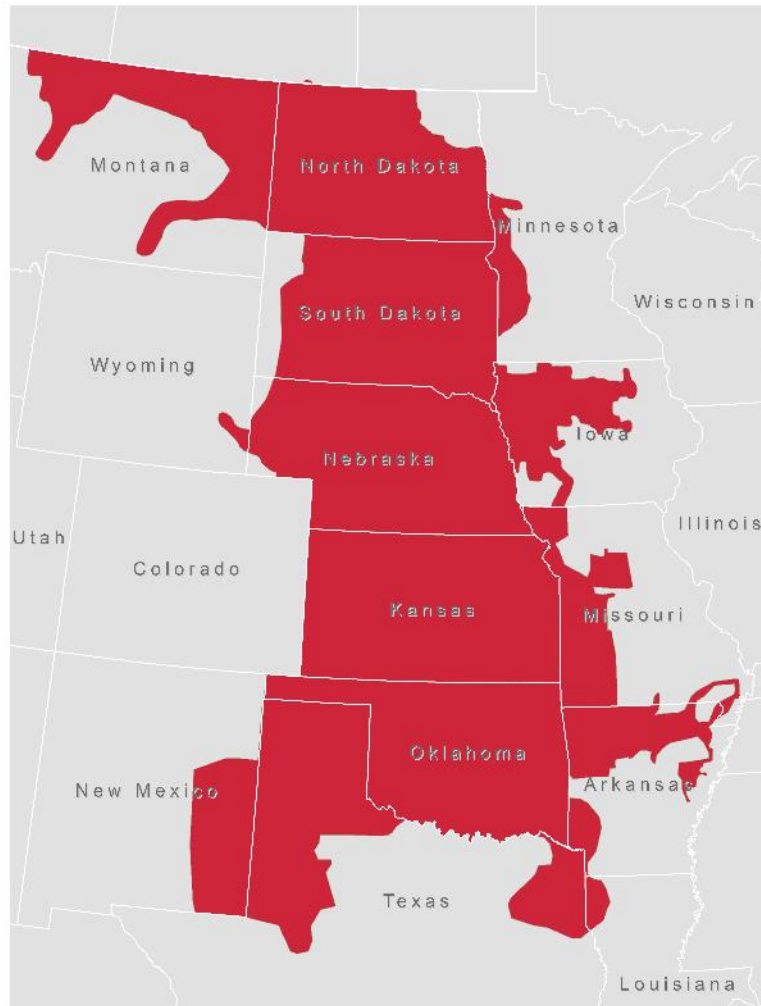
Evolution of Balancing Markets An SPP Perspective

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The SPP Footprint: Members in 14 States



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

Agenda

- Market evolution
- Dispatch efficiency
- Commitment efficiency
- Congestion rights
- What next



Evolution, not revolution



Why develop real-time markets?

- Retail open access removing the vertically integrated utility paradigm
- Load growth greater than generator siting for some load serving entities
 - Generation exists in a region to help defer siting of new generation
- Production cost efficiency
 - Aging generation for some load serving entities resulting in higher costs than the regional excess
- More effective transmission utilization
 - Markets tend to utilize transmission in real-time to their full limits

Real-time Market v.2

- Energy Imbalance Service (EIS) market design:
 - Real-time security constrained economic dispatch
 - Physical congestion rights
 - Energy imbalance settlement
 - Reserve sharing with economic redispatch administered by Regional Transmission Organization (RTO)
 - Regulation deployment administered by the individual Balancing Authority (BA)
 - Balancing Authorities retained all BA responsibilities
- The Real-time market was estimated to deliver \$80 million in savings in the first year
 - First year savings were in excess of \$100 million and final year of savings was in excess of \$175 million

Why create another market?

- Benefits of the EIS market were primarily from centralized energy dispatch
- Additional benefits could be obtained from centralized energy commitment
- Consolidation of Balancing Authorities (BA)
 - Ease staffing issues of BA desks
 - Reduce cost of BA operations
 - Reduce reportable events from expanding the region

Evolution, not revolution





The Energy Imbalance Service (EIS) Market economically dispatches wholesale energy to local utilities for distribution to customers

Just as UPS chooses appropriate vehicles from the lot and routes trucks for the most cost effective delivery, SPP does so with energy resulting in current savings in excess of \$100 million per year.



EIS Market uses the generation that is started by the utilities and power producers

The requirement for utilities to startup generation to meet their own obligations results in some generators idling all day long. Similar to having the too many “delivery vehicles” idling in the parking lot.



Integrated Marketplace benefits are primarily from centralized startup decisions

Just as a carpool arrangement avoids vehicles in the parking lot idling all day, centralized startup chooses the best mix of generation to meet the obligations for load, contracts, and reserves.

Integrated Marketplace will reduce excess generation startups.

	<u>On Peak Capacity</u>		<u>Off Peak Capacity</u>
Gas	19,554	Gas	14,084
Nuclear/Coal	22,532	Nuclear/Coal	22,080
Wind	3,129	Wind	3,407
Other	540	Other	238
Total Startup	45,755	Total Startup	39,571
Actual Load	41,117	Actual Load	26,032
Regulation	311	Regulation	380
Reserves	512	Reserves	512
Excess Startup	<u><u>3,816</u></u>	Excess Startup	<u><u>12,647</u></u>
<div>Savings are from reducing the “vehicles idling in the parking lot”</div>			



Congestion and Rights

Just like the highway system, transmission lines can have too much traffic (congestion). Congestion rights credit the participants for the additional costs of managing the traffic.



How are the congestion rights allocated?

Integrated Marketplace gives priority to the holders of a transmission reservation. Similar to a holder of an EZ Pass being allowed on the toll road when all other toll booths are closed.



Integrated Marketplace benefits a single Balancing Authority

A Balancing Authority (BA) is responsible for the real-time balancing of generation to load. The balancing is accomplished through using three products: energy, regulation (cruise control), and contingency reserves (insurance)

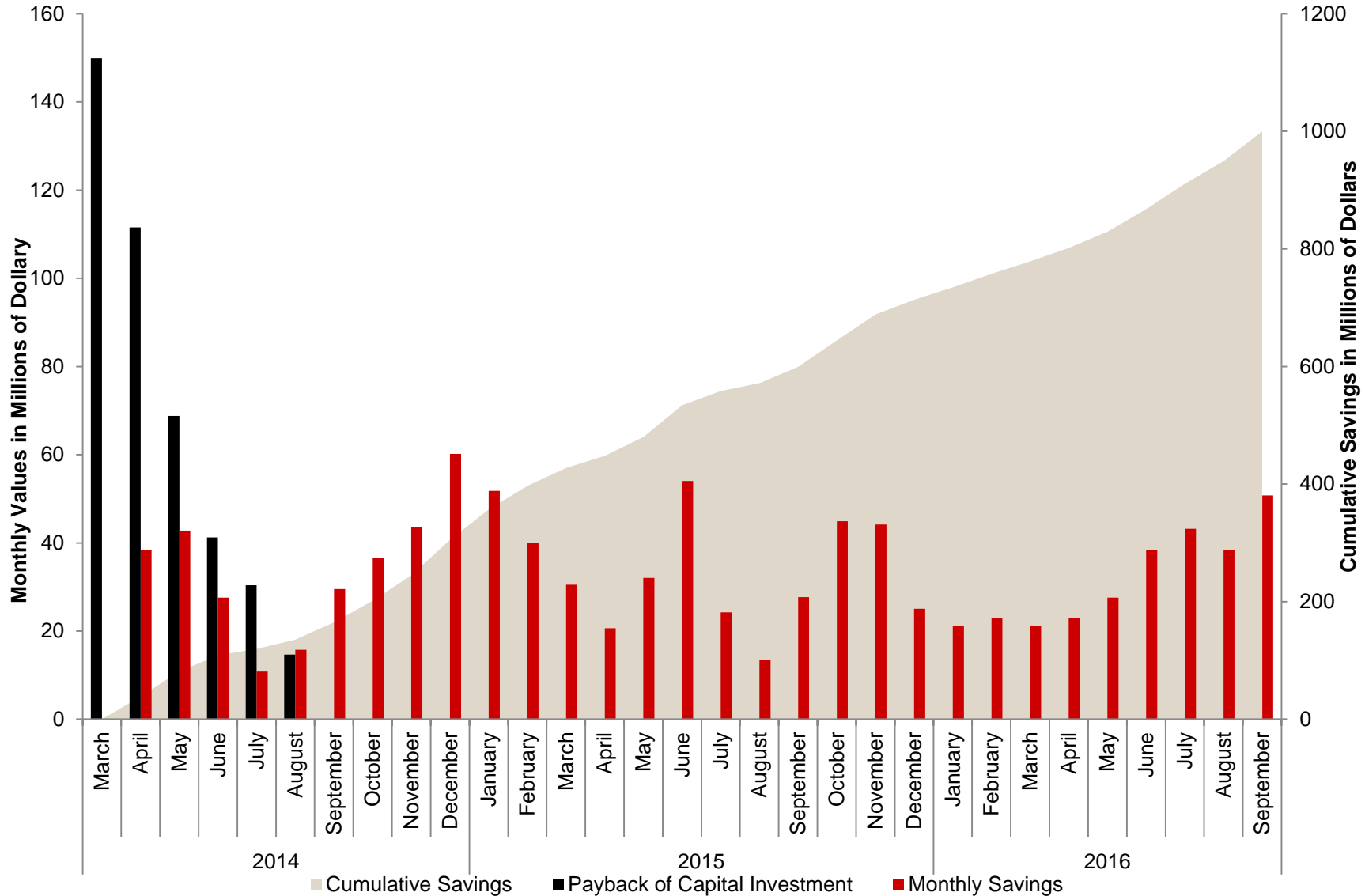


Why go to a single Balancing Authority?

Each of the sixteen Balancing Authorities are balancing their individual “seesaw”, even though some are going up when others are going down. A single Balancing Authority benefit includes balancing the region with less resources.

Integrated Marketplace Results Since March 2014

Savings outweighed costs and have exceeded \$1 billion



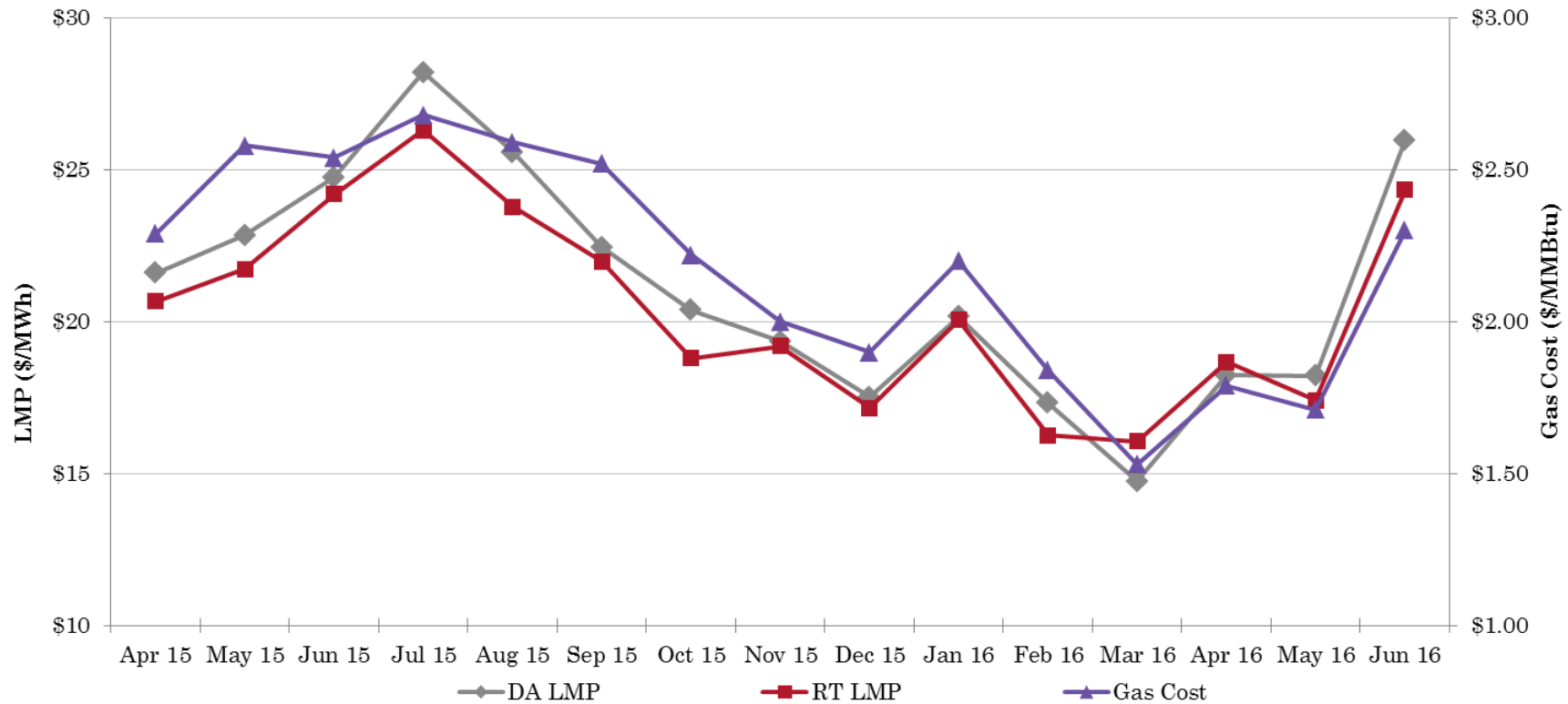
Operating Results have been good

- 122 Market Participants (MPs)
 - Financial only and asset owning
 - SPP had approximately 50 MPs in the EIS Market
- SPP BA has maintained control performance standards
 - Minimized inadvertent as much as possible
- System availability has exceeded expectations
 - Day-Ahead Market has posted on-time every day except once in early June (due to a modeling issue)
 - Real-Time Balancing Market has successfully solved 99.98% of all intervals

Congestion and wind integration has improved

- Congestion has been less than seen under EIS
 - Observation by SPP's reliability coordinators
 - Working to gather quantifiable observations
- SPP is managing in increasing amount of wind integration fairly well

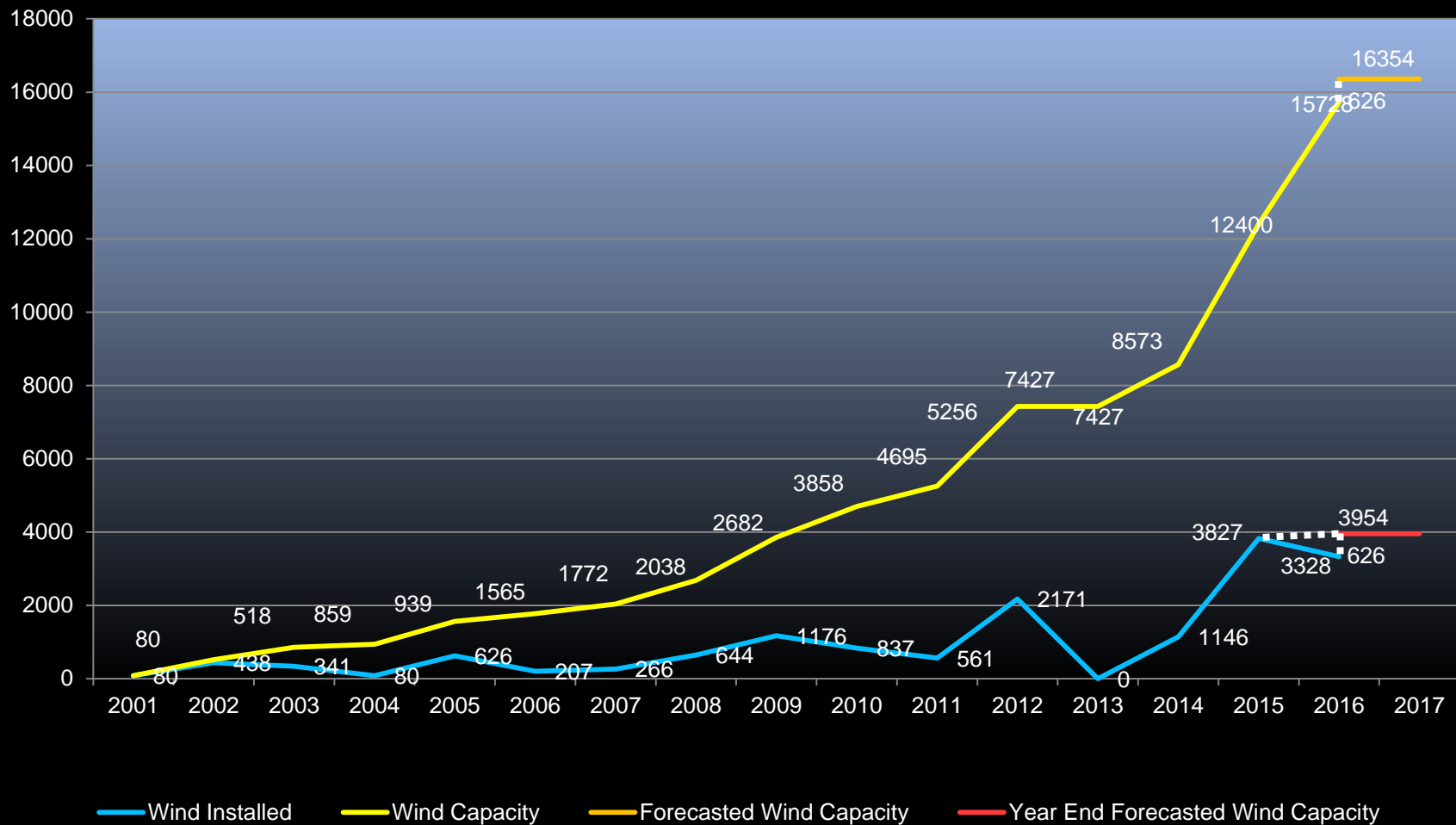
Real-Time price is generally lower than Day Ahead pricing



Marketplace Operational Highlights

- Peak Load of approximately 51 GW for 2016
 - New market footprint record
 - Largely due to addition of Integrated Systems October 2015
- Anticipate 14 GW of wind generation by year end

Wind Capacity has grown significantly



Wind output continues to grow in 2016, but is subject to “fuel” limitations

	Wind Output	Wind Penetration (% of Load)
Max	10,989 MW 4/23 @22:31	49.2% 4/24 @03:35
Min	161 MW 5/2 @19:56	0.7% 6/29 @15:44
2 nd Quarter Average	4,934 MW	18.3%

Integrated Marketplace Enhancements

2016 Implementation:

- Performance improvements in preparation for ECC (combined cycle enhancements)
- Member Facing enhancements
- Marketplace Timeline Changes
 - DA Market and DA RUC Timeline Changes to comply with Gas-Electric Coordination efforts

Near Term:

- ECC functionality
- Significant non-ECC related API changes based on MP-Requested enhancements
- Planned MP Impacting/MP Facing items

The industry and markets are always changing...

- Additional renewable penetration
 - Solar farms
 - Geo-thermal generation
- Distributed generation
 - Behind the retail meter
 - Behind the distribution meter
- Generator mix changes (carbon impacts)
- Design concerns:
 - Paying for online contingency generation
 - Controllability (ability to curtail generation)
 - What are the “costs”
 - Quality of the energy
 - Regulatory authority and “out of market” rules/subsidies



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