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*Acronyms, Market Participants, Asset Owners*

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**DISCLAIMER**

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• Gas costs continue to rise overall, with the average cost at the Panhandle Hub for Spring 2017 at $2.70/MMBtu, compared to $1.68/MMBtu in Spring 2016. As typical, with the rise in gas costs, comes a rise in LMP:
  o Average RTBM LMP for Spring 2017 was $23.48/MWh, compared to $17.07/MWh last year.
  o Average DAMKT LMP for Spring 2017 was $23.47/MWh, up from $17.37/MWh last year.

• Energy produced by coal generation continues a downward trend in the SPP footprint. During Spring 2015, 57% of energy was produced by coal generation, and has dropped to 40% in Spring 2017.

• While coal generation drops, the share of wind generation continues to increase in the SPP footprint, accounting for 28% of all energy produced in Spring 2017, compared to 15% in 2015 and 22% in 2016.
  o On March 19, wind generation penetration reached an all-time high of 54.2% in the SPP market, breaking a record that was previously set in February.

• For the Spring period, the volume of virtual transactions continued to increase with cleared virtual bids and offers making up 15% of load in 2017, compared to 10% in 2016 and 8% in 2015.
• Compliance with FERC Order 825, which requires RTOs to trigger shortage pricing for any interval in which a shortage of energy or operating reserves occurs, began on May 11, 2017. Compliance for this order was met with the acceptance of Revision Request (RR) 175. Previously energy shortages due to ramp were priced as VRLs (Violation Relaxation Limits), not as scarcity. The energy VRL has been changed to a scarcity price demand curve, set at $5,000/MWh, so that the LMP will more directly reflect the value of the shortage.

• The Spring reporting period represents March, April and May of each year.
This metric presents gas cost from the Panhandle Eastern Pipeline (PEPL) compared to electricity prices in the SPP footprint.

- Although the cost at PEPL is not an exact cost that may be experienced by a particular market participant or resource, the cost serves as a proxy for the overall gas costs experienced across the footprint.

Historically gas prices and Real-Time prices have been highly correlated in SPP.

- Workably competitive markets should experience highly correlated gas costs and energy prices in general.
- Although electricity prices and gas costs are highly correlated over time, some periods experience divergence.

Average gas costs had been on a general upward trend since the record low prices in March 2016 ($1.50/MMBtu), however, gas prices have stabilized in the $2.60 to $2.70/MMBtu range over the past four months.
1.1 Electricity Prices and Gas Costs

<table>
<thead>
<tr>
<th></th>
<th>Mar 16</th>
<th>Apr 16</th>
<th>May 16</th>
<th>Jun 16</th>
<th>Jul 16</th>
<th>Aug 16</th>
<th>Sep 16</th>
<th>Oct 16</th>
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<th>Dec 16</th>
<th>Jan 17</th>
<th>Feb 17</th>
<th>Mar 17</th>
<th>Apr 17</th>
<th>May 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Cost</td>
<td>1.53</td>
<td>1.79</td>
<td>1.71</td>
<td>2.35</td>
<td>2.57</td>
<td>2.62</td>
<td>2.79</td>
<td>2.76</td>
<td>2.29</td>
<td>3.43</td>
<td>3.17</td>
<td>2.64</td>
<td>2.60</td>
<td>2.75</td>
<td>2.76</td>
</tr>
</tbody>
</table>

Gas Cost is represented by cost at the Panhandle Eastern Pipeline

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA LMP</td>
<td>$22.13</td>
<td>$17.07</td>
<td>$23.47</td>
</tr>
<tr>
<td>RT LMP</td>
<td>20.95</td>
<td>17.37</td>
<td>23.48</td>
</tr>
<tr>
<td>Gas Cost</td>
<td>2.46</td>
<td>1.68</td>
<td>2.70</td>
</tr>
</tbody>
</table>
1.2 Day-Ahead and Real-Time Prices

- The following figure shows the Locational Marginal Price (LMP) for the Day-Ahead Market and the Real-Time Balancing Market. This is calculated by taking the simple average of LMP at the SPP North and SPP South hubs.
  - The LMP is made up of
    - Marginal Energy Component (MEC)
    - Marginal Congestion Component (MCC)
    - Marginal Loss Component (MLC)
1.2 Day-Ahead and Real-Time Prices

<table>
<thead>
<tr>
<th>Day Ahead</th>
<th>Mar 16</th>
<th>Apr 16</th>
<th>May 16</th>
<th>Jun 16</th>
<th>Jul 16</th>
<th>Aug 16</th>
<th>Sep 16</th>
<th>Oct 16</th>
<th>Nov 16</th>
<th>Dec 16</th>
<th>Jan 17</th>
<th>Feb 17</th>
<th>Mar 17</th>
<th>Apr 17</th>
<th>May 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA MCC</td>
<td>0.62</td>
<td>0.67</td>
<td>0.75</td>
<td>0.78</td>
<td>0.55</td>
<td>0.32</td>
<td>-0.97</td>
<td>0.47</td>
<td>-0.28</td>
<td>-0.03</td>
<td>0.37</td>
<td>0.28</td>
<td>1.09</td>
<td>2.26</td>
<td>1.33</td>
</tr>
<tr>
<td>DA MLC</td>
<td>-0.14</td>
<td>-0.07</td>
<td>-0.01</td>
<td>0.12</td>
<td>-0.08</td>
<td>0.04</td>
<td>-0.19</td>
<td>-0.26</td>
<td>-0.32</td>
<td>-0.14</td>
<td>-0.10</td>
<td>-0.18</td>
<td>-0.21</td>
<td>-0.27</td>
<td>-0.21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Real Time</th>
<th>Mar 16</th>
<th>Apr 16</th>
<th>May 16</th>
<th>Jun 16</th>
<th>Jul 16</th>
<th>Aug 16</th>
<th>Sep 16</th>
<th>Oct 16</th>
<th>Nov 16</th>
<th>Dec 16</th>
<th>Jan 17</th>
<th>Feb 17</th>
<th>Mar 17</th>
<th>Apr 17</th>
<th>May 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT MCC</td>
<td>1.24</td>
<td>1.38</td>
<td>0.78</td>
<td>1.44</td>
<td>1.40</td>
<td>1.27</td>
<td>1.17</td>
<td>2.84</td>
<td>0.81</td>
<td>2.66</td>
<td>1.43</td>
<td>1.36</td>
<td>1.84</td>
<td>4.03</td>
<td>0.93</td>
</tr>
<tr>
<td>RT MLC</td>
<td>-0.13</td>
<td>-0.13</td>
<td>-0.03</td>
<td>0.03</td>
<td>-0.12</td>
<td>0.09</td>
<td>-0.28</td>
<td>-0.30</td>
<td>-0.27</td>
<td>-0.25</td>
<td>-0.21</td>
<td>-0.24</td>
<td>-0.18</td>
<td>-0.34</td>
<td>-0.19</td>
</tr>
</tbody>
</table>

MEC - Marginal Energy Component  MCC - Marginal Congestion Component  MLC - Marginal Loss Component
1.3 Price Contour Maps

The following price contour maps provide an overall picture of congestion and price patterns in the footprint.
- Blue represents lower prices and red represents higher prices.
- Significant color changes across the map signify constraints that limit the transmission of electricity from one area to another.
- Some other factors that can influence congestion and resulting prices are generator and transmission outages, weather events, differences in fuel prices and differences in temperatures across the footprint.

Overall, pricing patterns between Day-Ahead and Real-Time are similar.
- Lower prices are more prevalent in the north due to less expensive generation in the area, and the west-central part of the footprint due to abundant low-cost wind generation in that area.
- Generally, the areas seeing the highest congestion, thus the highest average prices, include the area south of the Texas panhandle, northwest Oklahoma, and to a lesser extent, western North Dakota into Montana.

Maps for the Spring period, as well as the twelve month prices, are shown with each broken down for on-peak and off-peak periods.
1.3 Price Contour Maps Real-Time (March-May 2017)

Real-Time Off-Peak

Real-Time On-Peak
1.3 Price Contour Maps Day-Ahead (June 2016-May 2017)

Day-Ahead Off-Peak

Day-Ahead On-Peak
1.3 Price Contour Maps Real-Time (June 2016-May 2017)

Real-Time Off-Peak

Real-Time On-Peak
• The following figure shows the Day-Ahead to Real-Time price divergence at the SPP system level.
  o Price divergence is calculated as (RT LMP - DA LMP), using system prices for each interval (RTBM) or hour (DAMKT).
  o Price divergence % is calculated as [(RT LMP - DA LMP) / RT LMP], using system prices for each interval (RTBM) or hour (DAMKT).
  o The divergence (absolute) is calculated by taking the absolute value of the divergence for each interval (RTBM) or hour (DAMKT).

• The SPP Markets are experiencing some divergence between Day-Ahead and Real-Time.
  o This price divergence can be at least partially explained by the significant price volatility in the Real-Time Market.
  o Prices are expected to be more volatile in the Real-Time Balancing Market than the Day-Ahead Market.
1.4 Day-Ahead and Real-Time Price Divergence

PRICES

Divergence % is calculated as (RT LMP - DA LMP) / RT LMP

<table>
<thead>
<tr>
<th></th>
<th>Mar 16</th>
<th>Apr 16</th>
<th>May 16</th>
<th>Jun 16</th>
<th>Jul 16</th>
<th>Aug 16</th>
<th>Sep 16</th>
<th>Oct 16</th>
<th>Nov 16</th>
<th>Dec 16</th>
<th>Jan 17</th>
<th>Feb 17</th>
<th>Mar 17</th>
<th>Apr 17</th>
<th>May 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA LMP</td>
<td>$14.75</td>
<td>$18.24</td>
<td>$18.22</td>
<td>$25.98</td>
<td>$27.02</td>
<td>$26.31</td>
<td>$24.42</td>
<td>$26.65</td>
<td>$22.21</td>
<td>$27.92</td>
<td>$19.72</td>
<td>$20.88</td>
<td>$25.31</td>
<td>$24.21</td>
<td></td>
</tr>
<tr>
<td>Divergence</td>
<td>-1.31</td>
<td>-0.43</td>
<td>0.82</td>
<td>1.65</td>
<td>1.44</td>
<td>-0.59</td>
<td>-1.03</td>
<td>-1.34</td>
<td>0.34</td>
<td>0.15</td>
<td>-0.06</td>
<td>-1.37</td>
<td>-1.67</td>
<td>-1.14</td>
<td>2.76</td>
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<tr>
<td>Divergence (ABS)</td>
<td>4.92</td>
<td>5.80</td>
<td>4.44</td>
<td>4.99</td>
<td>4.76</td>
<td>5.90</td>
<td>5.99</td>
<td>8.50</td>
<td>5.58</td>
<td>8.48</td>
<td>6.27</td>
<td>7.06</td>
<td>9.32</td>
<td>11.40</td>
<td>9.02</td>
</tr>
<tr>
<td>Divergence %</td>
<td>-8.9%</td>
<td>-2.3%</td>
<td>4.5%</td>
<td>6.3%</td>
<td>5.4%</td>
<td>-2.2%</td>
<td>-4.2%</td>
<td>-5.1%</td>
<td>1.5%</td>
<td>0.5%</td>
<td>-0.2%</td>
<td>-6.9%</td>
<td>-8.0%</td>
<td>-4.5%</td>
<td>11.4%</td>
</tr>
</tbody>
</table>
• Pricing patterns in the Integrated Marketplace have generally stayed consistent across time.
  o The far southwest and western portions of the SPP footprint generally experience the highest average prices.
  o Entities in the northern portion of the footprint generally experience the lowest average prices.
  o These differences are driven by congestion patterns, parallel flows and high levels of low-cost generation.
1.5 Average LMP by Load-Serving Entity (March-May 2017)

Only load-serving entities are included.
Average is for the previous 12 months. Only load-serving entities are included.
Data for AEPE/SSCN only includes January-May 2017.
Data for UGPM_SMGT_X only includes June-December 2016.
• Volatility is represented using the coefficient of variation, which is the standard deviation divided by the mean for the period for each load-serving entity.
  o Previous volatility for the RTBM was calculated using an hourly average LMP. The volatility is now calculated using the 5 minute interval prices. This results in higher values than when using hourly averages, however, the overall results are still the same.

• The entities in western Kansas generally experience the highest levels of price volatility, while Oklahoma has the lowest volatility.
1.6 Price Volatility by Load-Serving Entity (March-May 2017)

Only load-serving entities are included.
Volatility is for the previous 12 months. Only load-serving entities are included.
Data for AEPE/SSCN only includes January-February 2017.
Data for UGPM_SMGT_X only includes March-December 2016.
Data for WRGS/PEOP_X only includes June 2016-February 2017.
The next figure shows monthly average Day-Ahead and Real-Time prices for the two Trading Hubs in SPP: the North and South hubs.

- A trading hub is a settlement location consisting of an aggregation of price nodes developed for financial and trading purposes.

Due to an abundance of lower-cost generation in the northern part of the SPP footprint, prices at the North Hub are consistently lower.

The average spread for real-time prices between the North and South Hub for Spring 2017 was $11.21, compared to $4.25 for Spring 2016.
• The following figures show Marginal Clearing Prices (MCP) for ancillary services in the SPP Integrated Marketplace.

• All operating reserve products are priced as market-based.

• The zonal limits for operating reserves have not been needed to ensure the deliverability of operating reserves since September 24, 2014, thus all zones have identical prices beyond September.
  o Figures shown for all months include the SPP average when different prices were in effect for reserve zones.

• Following FERC Order 825, SPP proposed, and the Market Participants approved, a new design feature of variable demand curve for operating reserve products. The new design introduces an upward sloping demand curve for operating reserves.
1.8 Ancillary Service Prices - Regulation

**PRICES**

### SPRING Comparison

<table>
<thead>
<tr>
<th>Year</th>
<th>Regulation Up RT</th>
<th>Regulation Up DA</th>
<th>Regulation Up Mileage RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>$8</td>
<td>$8</td>
<td>$8</td>
</tr>
<tr>
<td>2016</td>
<td>$16</td>
<td>$16</td>
<td>$16</td>
</tr>
<tr>
<td>2017</td>
<td>$12</td>
<td>$12</td>
<td>$12</td>
</tr>
</tbody>
</table>

### Regulation Up

- **Reg Up RT**
- **Reg Up DA**
- **Reg Up Mileage RT**

### Regulation Down

- **Reg Down RT**
- **Reg Down DA**
- **Reg Down Mileage RT**

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SPP Market Monitoring Unit
Spring 2017 State of the Market Report
1.8 Ancillary Service Prices - Reserves

### Spinning Reserves

- **Spin RT**
- **Spin DA**

### Supplemental Reserves

- **Supp RT**
- **Supp DA**

**SPRING Comparison**

<table>
<thead>
<tr>
<th>Year</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

$0$ $2$ $4$ $6$ $8$ $10$

$/MWh

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

$0$ $2$ $4$ $6$ $8$

$/MWh

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
• On occasion, SPP may have to re-price Real-Time intervals because of software or data errors that do not accurately reflect the application of the Tariff. Events that may result in data input errors include, but are not limited to:
  o bad or missing SCADA,
  o load forecast error,
  o missing intervals,
  o or human error.

• This chart shows both the percentage of Real-Time intervals that were re-priced during the month and the average total $ change per re-priced interval.

• Price corrections are calculated as the monthly average interval repriced amount (absolute value) represented as a percentage of the monthly average price:

\[
\frac{\text{Monthly Sum}(\text{Abs} (\text{Interval Initial Price} - \text{Interval Final Price}))}{\text{Monthly Intervals}} \times \frac{1}{\text{Monthly Average Price}}
\]
All price corrections are Real-Time.
• The impact of a constraint on the market can be illustrated by its shadow price, which reflects the intensity of congestion on the path represented by the flowgate.
  o The shadow price indicates the marginal value of an additional MW of relief on a constraint in reducing the total production costs.
  o The shadow price is also a key determinant in the Marginal Congestion Component of the LMP for each pricing point.

• Areas experience congestion, caused by many factors, including transmission and generation outages (planned or unplanned), weather events, and external impacts.

• Figure 2.1 shows both Day-Ahead and Real-Time congestion by shadow price for the three month period of the report.

• Figure 2.2 shows both Day-Ahead and Real-Time congestion by shadow price for the previous twelve months and includes projects that may provide relief to these congested flowgates.

• As has been the pattern recently, congestion over the past three months was highest in the western edge of the SPP footprint – western Oklahoma (Woodward area) and the Texas panhandle (Lubbock) – where the majority of the wind generation is located.

• An EHV phase shifting transformer was placed in service at Woodward in late May. The MMU will be watching to see what impact project will have on congestion in the Woodward area and the market as a whole.
2.1 Congestion by Shadow Price (March-May 2017)

**Flowgate Name** | **Owner** | **Region** | **Flowgate Location**
--- | --- | --- | ---
WDWFPLATNOW | SPP | Western Oklahoma | Woodward-FPL Switch 138kV ftlo Tatonga-Northwest 345kV (OGE)
SHAAYPOSKNO | SPP | Western Kansas | South Hays-Hays 115kV ftlo Post Rock-Knoll 345kV (MIDW)
NEORIVNEOBLC | SPP | SE Kansas/SW Missouri | Neosho-Riverton 161kV (WR-EDE) ftlo Neosho-Blackberry 345kV (WR-AECI)
TMP171_22413 | SPP | Western Oklahoma | Mooreland-Cedardale 138kV (WFEC) ftlo Tatonga-Matthewson 345kV (OGE)
TEMPS2_20619 | SPP | Western Oklahoma | Moorland-Glass Mountain 138kV (WFEC-OKGE) ftlo Tatonga-Northwest 345kV (OGE)
TEMPS6_22466 | SPP | West Texas (Lubbock) | Tucosta-Stanton 115kV ftlo Tucosta-Carlsile 230kV (SPS)
TMP215_21787 | SPP | Oklahoma City area | Cimarron-Draper 345kV (OGE) ftlo Lawton Eastside-Sunnyside 345kV (CSWS-OGE)
TMP142_22694 | SPP | Western Oklahoma | Hobart Jct.-Martha 138kV (CSWS) ftlo Sweetwater-Wheelr 230kV (CSWS-SPS)
TMP228_22696 | SPP | West Texas (Lubbock) | Hale County-Tucosta 115kV ftlo Swisher-Wheeler 230kV (SPS)
TMP103_22587 | SPP | Northern Oklahoma | Kildare Tp-White Eagle 138kV ftlo Hunter-Woodring 345kV (OKGE)

^ SPP Market-to-Market flowgate
### 2.2 Congestion by Shadow Price (June 2016 - May 2017)

#### Flowgate Summary

**Flowgate Name** | **Owner** | **Region** | **Flowgate Location**
--- | --- | --- | ---
WDWFPLATNOW | SPP | Western Oklahoma | Woodward-FPL Switch 138kV ftlo Tatonga-Northwest 345kV (OGE)
STAINDTUCCAR # | SPP | West Texas (Lubbock) | Stanton West-Indiana 115kV ftlo Tucar-Carlisle 230kV (SPS)
SHAHAYPOSKNO | SPP | Western Kansas | South Hays-Hays 115kV ftlo Post Rock-Knoll 230kV (MIDW)
NEORIVNEOBLC ^ | SPP | SE Kansas/SW Missouri | Neosho-Riverton 161kV (WR-EDE) ftlo Neosho-Blackberry 345kV (WR-AECI)
PLXSUNTOLYOA | SPP | West Texas (Lubbock) | Plant X Sub-Sundown 230kV ftlo Tolk-Yaakum 230kV (SPS)
TEMP50_20937 | SPP | West Texas (Lubbock) | Wolfforth-Terry County 115kV ftlo Sundown-Amoco Switching 230kV (SPS)
OSGCANBUSDEA | SPP | TX Panhandle (Amarillo) | Osage Switch-Canyon East 115kV ftlo Bushland-Deaf Smith 230kV (SPS)
TAHH59MUSPTS ^ | SPP | Arkansas/Oklahoma | Tahlequah-Highway 59 161kV ftlo Muskogee-Fort Smith 345kV (GRDA-OGE)
SILSPRTONFLI | SPP | NW Arkansas | Siloam-Siloam Springs 161kV ftlo Tonnece-Flint Creek 345kV (CSWS-GRDA)
SARMINELDMOL * | MISO | hsas/Louisiana | Sarepta-Minden 115kV ftlo El Dorado EHV-Mount Olive 500kV (EES)

* MISO Market-to-Market flowgate
^ SPP Market-to-Market flowgate

# STAINDTUCCAR also includes congestion from TMP145 21718, which became STAINDTUCCAR.

* MISO Market-to-Market flowgate
^ SPP Market-to-Market flowgate

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**Note:**
- DA Average Shadow Price
- RT Average Shadow Price
- DA % Intervals Congested
- RT % Intervals Congested

% Intervals Congested includes both breached and binding intervals

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**Flowgate Location**

- DA Average Shadow Price
- RT Average Shadow Price
- DA % Intervals Congested
- RT % Intervals Congested
## 2.2 Congestion by Shadow Price (June 2016 - May 2017)

<table>
<thead>
<tr>
<th>Flowgate Name</th>
<th>Region</th>
<th>Location</th>
<th>Projects that may provide mitigation</th>
</tr>
</thead>
</table>
| WDFPFLTATNOW  | Western Oklahoma | Woodward-FPL Switch 138kV ftlo Woodward EHV-Northwest 345kV (OGE) | 1. Matthewson - Tatonga 345 kV Ckt 2 (July 2018 – ITP10)  
2. Woodward EHV Phase Shifting Transformer (June 2017, Generation Interconnection; in service late May 2017) |
| STAINDTUCCAR # | West Texas (Lubbock area) | Stanton-Indiana 115kV ftlo Tuco-Carlisle 230kV (SPS) | 1. Tuco - Yoakum 345 kV Ckt 1 (June 2020 – ITPNT)  
2. Tuco – Stanton – Indiana – Erskine 115 kV Terminal Upgrades (June 2018, 2017 ITP10) |
| TEMP50_20937 | | Wolfforth-Terry County 115kV ftlo Sundown-Amoco Switching 230kV (SPS) | Wolfforth - Terry County 115 kV Terminal Upgrades (June 2018 – ITPNT) |
| PLXSUNTOLYOA | | Plant X Sub-Sundown 230kV ftlo Tolk-Yoakum 230kV (SPS) | Plant X - Sundown 230 kV Terminal Upgrades (December 2018, 2017 ITPNT - NOT YET APPROVED) |
| SHAHAYPOSKNO | Western Kansas | South Hays-Hays 115kV ftlo Post Rock-Knoll 230kV (MIDW) | 1. Hays - South Hays 115 kV rebuild (October 2016 – ITPNT)  
| NEORIVNEOBLC ^ | SE Kansas / SW Missouri | Neosho-Riverton 161kV (WR-EDE) ftlo Neosho-Blackberry 345kV (WR-AECI) | Neosho – Riverton 161kV Terminal Upgrades (June 2018, 2017 ITP10) |
| OSGCANBUSDEA | Texas Panhandle (Amarillo area) | Osage Switch-Canyon East 115kV ftlo Bushland-Deaf Smith 230kV (SPS) | 1. Canyon East Sub –Randall County Interchange 115 kV line (March 2018 – Aggregate Studies)  
2. Potter – Tolk 345 kV (January 2023, 2017 ITP10 - NOT YET APPROVED) |
| TAHH59MUSFTS ^ | Arkansas/Oklahoma - SPP M2M | Tahlequah-Highway 59 161kV ftlo Muskogee-Fort Smith 345kV (GRDA-OKGE) | No projects identified at the time of report publication. |
| SILSPRTONFLI | NW Arkansas | Siloam-Siloam Springs 161kV ftlo Tonnece-Flint Creek 345kV (CSWS-GRDA) | Siloam – Siloam Springs 161kV Rebuild (January 2019, 2017 ITP10) |
| SARMINELDMOL * | Arkansas/Louisiana - MISO M2M | Sarepta-Minden 115kV ftlo El Dorado EHV-Mount Olive 500kV (EES) | No projects identified at the time of report publication. |

# STAINDTUCCAR also includes congestion from TMP145_21718, which became STAINDTUCCAR.

* SISO Market-to-Market flowgate

^ SPP Market-to-Market flowgate
2.3 Congestion by Interval

- One way to analyze transmission congestion is to study the total incidence of intervals in which a flowgate was either breached or binding.
  - A breached condition is one in which the load on the flowgate exceeds the effective limit.
  - A binding flowgate is one in which flow over the element has reached but not exceeded its effective limit.

- Figure 2.3, Congestion by Interval, shows the percent of intervals by month that had at least one breach, had only binding flowgates (but no breaches), or had no flowgates that were breached or binding (uncongested).

- Congested intervals, especially intervals with breaches, have increased since the addition of the Integrated System on October 1, 2015. Reasons for this increase include increasing wind generation online, transmission and generation outages, and unaccounted flows from adjacent systems.
2.3 Congestion by Interval

**Day Ahead**

- Intervals with Breaches
- Intervals with Binding Only
- Uncongested Intervals

**Real Time**

- Intervals with Breaches
- Intervals with Binding Only
- Uncongested Intervals

**SPRING Comparison**

- Day Ahead
- Real Time

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
3.1 Generation by Fuel Type

• Total monthly generation is shown, broken down by fuel type of resources.
  o Renewable includes solar, biomass and other renewable resources (not including wind and hydro)
  o Other includes fuel oil and miscellaneous
  o Gas-CC represents natural gas combined-cycle units
  o Gas-SC includes all other natural gas simple-cycle units

• In the Real-Time market, generation by coal-powered resources continues a downward trend with only 40% of total energy produced in the Spring 2017 period, compared to 57% in 2015. This decline has been primarily offset by increases in wind generation.
3.1 Generation by Fuel Type (Real-Time)

Real-Time

Generation (TWh)

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

Other  Gas-SC  Gas-CC  Coal  Hydro  Renewable  Wind  Nuclear

SPRING Comparison

Average Monthly Generation (TWh)

25 20 15 10 5 0

2015 2016 2017

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
3.1 Generation by Fuel Type by Percent (Real-Time)

Real-Time

Spring 2017 State of the Market Report

SPP Market Monitoring Unit
3.1 Generation by Fuel Type (Day-Ahead)
3.1 Generation by Fuel Type by Percent (Day-Ahead)
3.2 Wind Capacity and Capacity Factor

• The following figure shows wind capacity (nameplate in GW) and the wind capacity factor for the past 15 months.

• Note that the wind capacity figure is reported as of month-end, while the capacity factor is reported for the entire month.

• Wind resources may be considered in-service, but are not yet in commercial operation. In this situation, the capacity will be counted, however, the resource will not be providing any generation.
3.2 Wind Capacity and Capacity Factor

**SPRING Comparison**

- **Wind Capacity (GW)**
  - Mar 16: 12
  - Apr 16: 12
  - May 16: 12
  - Jun 16: 12
  - Jul 16: 12
  - Aug 16: 12
  - Sep 16: 12
  - Oct 16: 12
  - Nov 16: 12
  - Dec 16: 12
  - Jan 17: 12
  - Feb 17: 12
  - Mar 17: 12
  - Apr 17: 12
  - May 17: 12

- **Capacity Factor**
  - Mar 16: 0%
  - Apr 16: 10%
  - May 16: 20%
  - Jun 16: 30%
  - Jul 16: 40%
  - Aug 16: 50%
  - Sep 16: 60%
  - Oct 16: 50%
  - Nov 16: 40%
  - Dec 16: 30%
  - Jan 17: 20%
  - Feb 17: 10%
  - Mar 17: 0%
  - Apr 17: 10%
  - May 17: 20%

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SPP Market Monitoring Unit
Spring 2017 State of the Market Report
• The next figure shows the fuel types of marginal units in both the Real-Time Balancing Market and the Day-Ahead Market.
  o Marginal units set the Locational Marginal Price in each five minute interval in each five minute interval in the RTBM, and in each hour in the DAMKT.
  o During congested periods, the market is effectively segmented into several sub-areas, each with its own marginal resource.
  o During non-congested periods, one resource sets the price for the entire market, thus that resource is marginal for the interval.
  o When there is congestion, there can be more than one marginal unit during a five-minute interval.

• Coal resources on the margin in the real-time market continue to decline with coal resources setting prices 29% of the time in Spring 2017 compared to 48% in 2015. Coal has primarily been replaced by gas combined cycle units (21% in 2015, 31% in 2017) and wind resources (6% in 2015, 15% in 2017).
3.3 Fuel on the Margin (Day-Ahead) GENERATION

SPRING Comparison

% Intervals on Margin

0% 20% 40% 60% 80% 100%


Other Gas-SC Gas-CC Coal Wind

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
• The following figure shows ramp available to the system as standardized by available capacity, compared to the average online capacity.
  o Ramp rates play a key role in Market operations because they place limits on how quickly a unit can respond to changes in loading conditions and the need for redispatch to manage congestion.
• The next figure shows the monthly average available ramp per interval along with the number of intervals with a ramp deficiency each month.
  o If ramp rates are too low, the market cannot respond quickly enough to manage system changes and ramp deficiencies will occur. Deficiencies result in price spikes that indicate a need for additional ramp.
3.5 Ramp Offered and Deficiency Intervals (Real-Time)

**SPRING Comparison**

- **MW Ramp Available per Minute**
- **Ramp Deficiency Intervals**
  - Up Ramp Deficiency Intervals
  - Down Ramp Deficiency Intervals
  - MW Ramp Offered per Minute

**Graph Details**
- **Y-axis**: MW Ramp Available per Minute.
- **Legend**:
  - Red: Up Ramp Deficiency Intervals
  - Orange: Down Ramp Deficiency Intervals
  - Grey: MW Ramp Offered per Minute

**Notes**
- SPP Market Monitoring Unit
- Spring 2017 State of the Market Report

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*Generated by Assistant*
• The following figure shows the average hourly (MW) exports and imports for each month.
3.6 Imports and Exports

SPRING Comparison

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

RT Import  DA Import  RT Export  DA Export  RT Net (Import)/Export  DA Net (Import)/Export

MW (Average Hourly)

48
• The next figure shows load scheduling for the peak hour.
  o Under-scheduling load can cause SPP to commit more expensive peaking resources in real-time in order to satisfy load.
  o Some real-time commitments may be made regardless of load scheduling due to the need to address reliability concerns, relieve local congestion or meet ramp demands.
  o Over-scheduling load can suppress real-time price signals by overstating load.
The next figure shows the Real-Time average hourly offered capacity for the peak hour.

- Capacity above the line indicates that there is generally sufficient available capacity to meet peak load obligations.

Although levels fluctuate from month to month, coal and gas resources typically account for 80-90% of offered capacity during peak hours.
4.2 Average Hourly Offered Capacity (Real-Time)

UNIT COMMITMENT

GW

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

Nuclear Wind Renewable Hydro Coal Gas Other RT Peak Load Obligation

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
• The following figure shows the Real-Time Average Peak Hour Capacity Overage.
  o SPP calculates the amount of capacity overage required for the Operating Day to ensure that unit commitment is sufficient to reliably serve load in Real-Time while maintaining the Operating Reserve requirements.
  o This is calculated as: Economic Maximum – Load – Net Scheduled Interchange – (Regulation Up + Spinning Reserves + Supplemental Reserves)
4.3 Average Peak Hour Capacity Overage (Real-Time)  

UNIT COMMITMENT

Economic Maximum – Load – Net Scheduled Interchange – (Regulation Up + Spinning Reserves + Supplemental Reserves)

SPRING Comparison

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
5.1 Virtual Transactions

- Virtual trading in the Day-Ahead Market facilitates convergence between the Day-Ahead and Real-Time prices.
  - Virtual trading helps improve the efficiency of the Day-Ahead Market and moderates market power.

- Virtual transactions scheduled in the Day-Ahead Market are settled in the Real-Time Market.
  - Virtual demand bids are profitable when the Real-Time energy price is higher than the Day-Ahead price.
  - Virtual supply offers are profitable when the Day-Ahead energy price is higher than the Real-Time price.

- The following figure shows cleared and uncleared virtual demand bids and supply offers.

- As this figure shows, and other figures in this section show, virtual transactions have steadily increased from year to year, with the vast majority of the increase attributed to financial only market participants.
5.1 Virtual Transactions

Virtual trading in the Day-Ahead Market facilitates convergence between the Day-Ahead and Real-Time prices.

Virtual demand bids are profitable when the Real-Time energy price is higher than the Day-Ahead price.

Virtual supply offers are profitable when the Day-Ahead energy price is higher than the Real-Time price.

**SPRING Comparison**

Demand Bids

Supply Offers

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
Virtual trading in the Day-Ahead Market is expected to facilitate convergence between the Day-Ahead and Real-Time prices.

For the Spring period, virtual transactions as a percent of reported load has increased from 9% in 2015, to 11% in 2016, and then to 15% in 2017.
Virtual trading in the Day-Ahead Market facilitates convergence between the Day-Ahead and Real-Time prices. Virtual demand bids are profitable when the Real-Time energy price is higher than the Day-Ahead price. Virtual supply offers are profitable when the Day-Ahead energy price is higher than the Real-Time price.
• Virtual trading in the Day-Ahead Market is expected to facilitate convergence between the Day-Ahead and Real-Time prices.
  o Participants with physical assets (resources and/or load) often place transactions in order to hedge physical obligations.
  o In contrast, financial-only participants generally arbitrage prices.

• The vast majority of Virtual transactions are placed by Financial Only participants.

• While the number of virtual demand bids by resource/load owners has remained negligible, demand bids by financial-only participants has increased by nearly 40% from 2015 to 2017.

• Virtual supply offers by financial-only participants has nearly doubled in that same period.
5.3 Virtual Transactions by Participant Type

Virtual trading in the Day-Ahead Market facilitates convergence between the Day-Ahead and Real-Time prices. Virtual demand bids are profitable when the Real-Time energy price is higher than the Day-Ahead price. Virtual supply offers are profitable when the Day-Ahead energy price is higher than the Real-Time price.

**SPRING Comparison**

- Demand Bids
- Supply Offers

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SPP Market Monitoring Unit  
Spring 2017 State of the Market Report
• The next figure summarizes virtual transactions by location type –
  o hub,
  o interface,
  o resource or
  o load.

• Since the start of the Integrated Marketplace, the great majority of virtual
  transactions are made at resources, with the fewest transactions at external
  interfaces.
Virtual trading in the Day-Ahead Market facilitates convergence between the Day-Ahead and Real-Time prices. Virtual demand bids are profitable when the Real-Time energy price is higher than the Day-Ahead price. Virtual supply offers are profitable when the Day-Ahead energy price is higher than the Real-Time price.
5.4 Virtual Transactions by Location Type (Profit/Loss)

Virtual trading in the Day-Ahead Market facilitates convergence between the Day-Ahead and Real-Time prices. Virtual demand bids are profitable when the Real-Time energy price is higher than the Day-Ahead price. Virtual supply offers are profitable when the Day-Ahead energy price is higher than the Real-Time price.

**SPRING Comparison**

Profit is represented by negative values.
• The next figure summarizes the monthly profitability of virtual demand bids and supply offers.

• Gross virtual profits for Spring 2017 totaled nearly $24 million, while gross virtual losses totaled just under $19 million, compared to $8 million gross profits and $6 million gross losses in Spring 2017.
Virtual trading in the Day-Ahead Market facilitates convergence between the Day-Ahead and Real-Time prices. Virtual demand bids are profitable when the Real-Time energy price is higher than the Day-Ahead price. Virtual supply offers are profitable when the Day-Ahead energy price is higher than the Real-Time price.
TCR/ARR funding is derived as follows:

1. Day-ahead revenue is collected daily
2. TCR holders are paid daily based on awarded TCR MW and Day-ahead clearing prices
   a. Uplift is charged daily
   b. Surpluses are redistributed Monthly and Annually
3. TCR revenue is collected daily based on TCR MW and TCR ACPs (consistent through month/season)
4. ARR holders are paid daily based on ARR MW and TCR ACPs (consistent through month/season)
   a. Uplift is charged daily
   b. Surpluses are redistributed Monthly and Annually

The TCR/ARR funding year begins in June each year. The break in the dash line for cumulative funding percent represents the start of the new funding year.

RR91, which changed the annual allocation percentage for ARRs, was implemented in 2016. The purpose of this was to reduce the over-allocation of ARRs in outlying seasons of the Annual ARR Allocation, and to align the percentages of transmission capacity with that of the Annual TCR Auction.
6.2 ARR Funding Summary

TRANSMISSION CONGESTION RIGHTS

SPP Market Monitoring Unit
Spring 2017 State of the Market Report

Funding Percent
Cumulative Funding Percent

TCR Revenue
ARR Funding
ARR Surplus
Funding Percent
Cumulative Funding Percent

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

Funding Percent
Millions

2015 2016 2017

Funding Percent
Millions

2015 2016 2017

SPP Market Monitoring Unit
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A Make Whole Payment (uplift) is paid to a generator when the market commits a generator with offered costs exceeding the market revenue for the commitment period.

- The Day-Ahead Make Whole Payment applies to commitments from the Day-Ahead Market.
- The RUC Make Whole Payment applies to commitments made in the Day Ahead RUC and Intra-Day RUC processes.

Day-Ahead Make Whole Payments are typically less frequent and lesser in magnitude than in the RUC Make Whole Payments in the Real-Time Market.

As expected, the majority of the RUC Make Whole Payments are paid to gas resources, and more specifically gas simple-cycle resources.
7.1 Make Whole Payments

**Day-Ahead**

- Wind
- Renewable
- Nuclear
- Hydro
- Coal
- Gas-CC
- Gas-SC
- Other

**SPRING Comparison**

- Wind
- Renewable
- Nuclear
- Hydro
- Coal
- Gas-CC
- Gas-SC
- Other

**RUC (Real-Time)**

- Wind
- Renewable
- Nuclear
- Hydro
- Coal
- Gas-CC
- Gas-SC
- Other
7.2 Make Whole Payment - Distribution Rate

The Make Whole Payment Distribution Charge is applied to Asset Owners that receive benefits from units committed in the Day-Ahead and Real-Time Markets.

- The Day-Ahead Make Whole Payment Distribution Amount is an hourly charge or credit based on a daily allocation.
- The total of all Make Whole Payments paid to generation resources is spread among all Asset Owners according to the ratio of the withdrawals relative to a specific market.
- For the Day-Ahead market, the distribution rate is the sum of all DA Market Make Whole Payments for the day, divided by the total DA Market withdrawals.
- For the Real-Time Market, the distribution rate is the sum of RT Make Whole Payments for the day divided by the total RT Market deviation.
7.2 Make Whole Payment - Distribution Rate

**Day-Ahead**

- $0/MWh
- $1/MWh
- $2/MWh
- $3/MWh

**RUC**

- $0/MWh
- $1/MWh
- $2/MWh
- $3/MWh

**SPRING Comparison**

- $0/MWh
- $1/MWh
- $2/MWh
- $3/MWh
Each market participant with registered load is required to satisfy the must-offer obligation for each asset owner associated with that registered load.

A market participant is in compliance if:
- The market participant has offered its available resources for an asset owner with a commitment status of Market, Self, or Reliability; or
- The market participant has net resource capacity for that asset owner greater than or equal to 90% of its load for that asset owner.

If a Market Participant is not in compliance with the must-offer obligation, it will be assessed a Day-Ahead Must-Offer (DAMO) penalty.
- The penalty amount is equal to the Day-Ahead Market LMP associated with the withheld capacity.
- When Must-Offer Penalty revenues are collected, the revenues are distributed to the Market Participants for an Asset Owner on a pro-rata basis for that Asset Owner's offered Resources. The Market Participant who failed the obligation does not receive a payment.

Note that in Figure 7.3, figures shown are from the most recent settlement statements available for that time period and are subject to resettlement.

Overall, the Day-Ahead Must-Offer failures continue to represent a very small portion of the Day-Ahead Market.
7.3 Day-Ahead Must-Offer Penalty UPLIFT

Thousands

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

$0 $20 $40 $60 $80 $100
Revenue Neutrality Uplift (RNU) ensures settlement payments/receipts for each hourly settlement interval equal zero.
- Positive RNU - SPP receives insufficient revenue and collects from market participants.
- Negative RNU - SPP receives excess revenue, which must be credited back to market participants.

Revenue neutrality uplift is comprised by the following components:
- DA Revenue Inadequacy
- RT Revenue Inadequacy
- RT Out of Merit Energy (OOME) Make Whole Payment
- RT Regulation Deployment Adjustment
- RT Joint Owned Asset (JOA) Adjustment
- RT Inadvertent Interchange Adjustment
- RT Congestion Adjustment

Figures shown are from the most recent settlement statements available for that time period and are subject to change due to resettlement.
7.4 Revenue Neutrality Uplift (RNU)

**SPRING Comparison**

<table>
<thead>
<tr>
<th>Month</th>
<th>RNU (Thousands)</th>
</tr>
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<tbody>
<tr>
<td>Mar 16</td>
<td>$4,000</td>
</tr>
<tr>
<td>Apr 16</td>
<td>$2,000</td>
</tr>
<tr>
<td>May 16</td>
<td>$0</td>
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<tr>
<td>Jun 16</td>
<td>$2,000</td>
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<td>$4,000</td>
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<td>Aug 16</td>
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<tr>
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<td>$2,000</td>
</tr>
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<td>Jan 17</td>
<td>$4,000</td>
</tr>
<tr>
<td>Feb 17</td>
<td>$0</td>
</tr>
<tr>
<td>Mar 17</td>
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</tr>
<tr>
<td>Apr 17</td>
<td>$4,000</td>
</tr>
<tr>
<td>May 17</td>
<td>$0</td>
</tr>
</tbody>
</table>

**Total Marketplace RNU**

2015 2016 2017

Monthly Average

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
### 7.4 Revenue Neutrality Uplift (RNU)

<table>
<thead>
<tr>
<th></th>
<th>Mar 16</th>
<th>Apr 16</th>
<th>May 16</th>
<th>Jun 16</th>
<th>Jul 16</th>
<th>Aug 16</th>
<th>Sep 16</th>
<th>Oct 16</th>
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<th>Dec 16</th>
<th>Jan 17</th>
<th>Feb 17</th>
<th>Mar 17</th>
<th>Apr 17</th>
<th>May 17</th>
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</thead>
<tbody>
<tr>
<td><strong>DA Revenue Inadequacy</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td><strong>RT JOA Adj</strong></td>
<td>576</td>
<td>-187</td>
<td>387</td>
<td>182</td>
<td>-274</td>
<td>-525</td>
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<td>942</td>
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<td>893</td>
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<td>924</td>
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<tr>
<td><strong>RT Congestion Adj</strong></td>
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<td>-3,446</td>
<td>-1,645</td>
<td>-5,865</td>
<td>-5,652</td>
<td>-4,129</td>
<td>-6,755</td>
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<td><strong>TOTAL RNU</strong></td>
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<td>697</td>
<td>743</td>
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<td>-3,241</td>
<td>5,836</td>
<td>8,502</td>
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</tbody>
</table>

*This table is based on the latest available settlements data and is subject to change due to resettlement*
Market to Market is a coordinated exchange of cost of re-dispatch (Shadow Prices), requested market flow relief, and control indicators between SPP and MISO.

- This coordination allows for the neighboring market (non-monitoring RTO) to provide relief to congestion if it can do so more economically.
- Market to Market payments are made based on the non-monitoring RTO’s (NMRTTO) market flow against their Firm Flow Entitlement (FFE) and the Shadow Price during the congestion.
- NMRTTO market flow above FFE = NMRTTO pays MRTO
- NMRTTO market flow below FFE = MRTO pays NMRTTO

The first graph shows totals by month.

The second graph shows totals by constraint for the Spring 2017 period.
7.5 Market to Market UPLIFT

-3,000
-2,000
-1,000
$0
$1,000
$2,000
$3,000
$4,000
$5,000

Mar 16 Apr 16 May 16 Jun 16 Jul 16 Aug 16 Sep 16 Oct 16 Nov 16 Dec 16 Jan 17 Feb 17 Mar 17 Apr 17 May 17

Thousands

Receipts (MISO -> SPP) Payments (SPP -> MISO) Net

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7.5 Market to Market (March-May 2017)

* Only includes those flowgates with over $50,000 in net Market to Market payments.

* Only includes those flowgates with over $50,000 in net Market to Market payments.
**7.5 Market to Market (March-May 2017)**

**UPLIFT**

**M2M Flowgates (Net Payments over $50,000 MISO → SPP)**

**NEORIVNEOBLC** [SPP, M2M] Neosho-Riverton 161kV (WR-EDE) ftlo Neosho-Blackberry 345kV (WR-AECI)

**TMP260_22592** [SPP, M2M] Council Bluffs-Sub 1206 161kV (MEC-OPPD) ftlo Council Bluffs-Sub3456 345kV (MEC-OPPD)

**TAHH59MUSFTS** [SPP, M2M] Tahlequah-Highway 59 161kV ftlo Muskogee-Fort Smith 345kV (GRDA-OGE)

**TMP266_22396** [MISO, M2M] Danville-Ola 115kV (EES) ftlo Dardanelle Dam-Russellville S 161kV (EES-SPA), Russellville E-Russellville S 161kV (EES)

**TEMP53_22517** [SPP, M2M] Reeds Spring-Aurora 161kV (EDE) ftlo Beaver Dam-Eureka Springs 161kV (SPA)

**TMP139_22397** [SPP, M2M] VBI North-Grand Prairie 161kV ftlo VBI North-Twin Bridges 161kV (OGE)

**TMP188_21776** [SPP, M2M] Dumont-Parkersburg 69kV, Kesley-Parkersburg 69kV (WAUE)

**SIOLAWSPLSIO** [SPP, M2M] Sioux Falls-Lawrence 161kV ftlo Split Rock-Sioux Falls 230kV (NSP)

**NASXFRNASW** [SPP, M2M] Nashua Xfmr1 345kV ftlo Nashua-Hawthorn 345kV (KCPL)

**IATSTRNASHAW** [SPP, M2M] Iatan-Stranger Creek 345kV (WR-KCPL) ftlo Nashua-Hawthorn 345kV (KCPL)

**TEMP10_22193** [MISO, M2M] Hickory Creek-Lore 161 kV ftlo Hickory Creek-Salem 345kV (ALTW)

**TMP219_22700** [MISO, M2M] Danville-Ola 115kV ftlo Clarksville-Dardanelle Dam 161kV (EES)

**TEMP73_21393** [SPP, M2M] Lawrence-Siouxfalls 115kV (WAUE-NSP) ftlo Split Rock-Sioux Falls 230kV (NSP-WAUE)

**TMP210_22599** [MISO, M2M] Fox Lake-Rutland 161kV (ALTW) ftlo Crandall-Feldon 345kV, Feldon-Walmart 345kV (NSP)

**TMP191_22422** [SPP, M2M] Raun-Tekamah 161kV ftlo Raun-Fort Calhoun 345kV (MEC-OPPD)

**MCAXF2MCAXF1** [MISO, M2M] McAdams Xfmr2 500kV ftlo McAdams Xfmr1 500kV (EES)

**REDWILLMNGO** [SPP, M2M] Red Willows (NPPD)-Mingo (SECI) 345kV

**M2M Flowgates (Net Payments over $50,000 SPP → MISO)**

**TMP256_22373** [MISO, M2M] Triboji-WPT2 69kV (ALTW) ftlo Cayler-Wisdom 161kV (WAUE-ALTW)

**TMP263_22372** [MISO, M2M] Mayfair-LaCrosse 161kV (NSP) ftlo Eau Claire-Arpin 345kV (NSP-ALTE)

**CHEHOTRUSDAR** [MISO, M2M] Cheetah-Hot Springs Village 115kV (EES) ftlo Russellville South-Dardanelle Dam 161kV (EES-SPA)

**TMP161_22749** [MISO, M2M] Dolet Xfrm 345/230kV (CLEC) ftlo El Dorado EHV-Mt. Olive 500kV (EES)

**TMP241_22631** [SPP, M2M] Clarinda-Maryville 161kV (MEC-GMOC) ftlo Cooper-Fairport 345kV (NPPD-AECI), Cooper-St. Joe (NPPD-GMOC)

**GRIMTZGRIMAG** [MISO, M2M] Grimes-Mt. Zion 138kV ftlo Grimes- 138kV (EES)
• On March 1, 2015, SPP implemented its Regulation Compensation market design in compliance with FERC Order 755. It includes payment to market participants based on changes in energy output for regulation deployment.

• During March 2015, SPP cleared more regulation mileage than necessary with a regulation mileage factor of 1.0 for both regulation up and down. The factor has been adjusted to a more realistic value, averaging near 0.2, since then. The lower factor results in fewer unused mileage make whole payments.
7.6 Regulation Mileage Make Whole Payments

**Regulation Up**

![Graph showing Regulation Up with data points for each month from March 2016 to May 2017. The x-axis represents months, and the y-axis represents Thousands. The graph includes lines for DA Unused Mileage MWP, RT Unused Mileage MWP, and Regulation Mileage Factor.]

**Regulation Down**

![Graph showing Regulation Down with data points for each month from March 2016 to May 2017. The x-axis represents months, and the y-axis represents Thousands. The graph includes lines for DA Unused Mileage MWP, RT Unused Mileage MWP, and Regulation Mileage Factor.]

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**SPRING Comparison**

![Bar chart comparing SPRING with data for each year from 2015 to 2017. The x-axis represents the years, and the y-axis represents Thousands. The chart includes bars for DA Unused Mileage MWP, RT Unused Mileage MWP, and Regulation Mileage Factor.]

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SPP Market Monitoring Unit
Spring 2017 State of the Market Report
• The All-in Price includes the cost of energy, Day-Ahead and Real-Time RUC Make-Whole Payments, Operating Reserves and Reserve Sharing Group costs, and payments to Demand Response Resources. The cost of energy includes all of the shortage pricing components.

• The energy cost in the SPP Market constitutes 97.5% of the All-in Price, showing that uplift makes up a very small amount of the total price incurred by market participants.
7.7 All-in Price UPLIFT

SPRING Comparison

SPP Market Monitoring Unit
Spring 2017 State of the Market Report
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