# FTR/ARR Market Problem Statement Discussion

MIC October 16, 2019

Joseph Bowring Howard Haas Seth Hayik



### From the board report (Appendix p.13): Recommendations for the FTR Market

- "In trying to fashion recommendations for an FTR market by using the policies and procedures of a futures exchange clearinghouse some key differences need to be recognized."
- "Futures markets are continuous auction markets. Trading takes place throughout business hours on each and every trading day. Trading sessions are not periodic, scheduled events."
  - More auctions?
  - Discussed in current task force (FRMSTF).
- Futures contracts focus liquidity on one, or, at most, a few delivery points. PJM offers FTRs on thousands of paths. PJM does not have liquidity focused on a single point; its liquidity is dispersed across many points.
  - Look at bid points
  - Part of IMM issue charge
- "We suggest a more general review of the FTR market and other PJM markets, to evaluate the risks and rewards of potential structural reforms (see recommendation F3)."
  - Review the risk/reward of the market of potential structural reforms
    - Risk discussion in current FRMSTF
    - Phase 1: Review reward potential the focus of IMM issue charge.
    - Phase 2: Anything else, so long as consistent with Phase 1.



### **IMM Problem Statement/Opportunity Statement**

- PJM's ARR/FTR Market Construct should be reviewed and changes considered to improve alignment between definition of congestion rights and actual congestion payments.
- There is a clear problem with the current construct as a means of offsetting congestion.
- In Phase 1, the PJM ARR/FTR Market Construct should be reviewed and changes considered to improve the alignment between allocated congestion rights and actual congestion.
  - Identifies and addresses an identified problem
- Phase 2: Identification of additional issues with the ARR/FTR market, not considered in Phase 1 and consistent with the modifications from Phase 1.
  - Provide an opportunity to consider other problems.

### **Expected Deliverables**

#### Phase 1

- Identification of causes of mismatch between the allocation of congestion rights and the payment of congestion.
- Decide whether to recommend changes to the ARR/FTR market design.
- Proposed revisions to the ARR/FTR market construct to better align congestion rights with payment of congestion.

#### Phase 2

©2019

- Identification of additional issues with the ARR/FTR market, not considered in Phase 1 and consistent with the modifications from Phase 1.
- Decide whether to recommend any additional changes to the ARR/FTR market design, consistent with the modifications from Phase 1.
- Proposed revisions to the ARR/FTR market construct to address issues raised in Phase 2, consistent with the modifications from Phase 1.

## Zonal Offset 18/19 Actual (Surplus is allocated to load)

| AEP \$56.8 \$38.9 \$(\$23.7) \$21.8 \$93.8 \$129.6 \$(\$18.9) \$(\$5.1) \$105.7 88.79 APS \$40.8 \$10.4 \$(\$9.2) \$8.9 \$50.9 \$53.7 \$(\$6.9) \$(\$2.0) \$44.8 113.69 ATSI \$43.3 \$0.3 \$(\$12.4) \$6.7 \$37.9 \$64.8 \$(\$9.7) \$(\$2.6) \$52.5 72.39 BGE \$67.2 \$1.5 \$(\$5.8) \$10.7 \$73.6 \$26.1 \$(\$4.8) \$(\$1.2) \$20.0 367.39 ComEd \$91.7 \$10.2 \$(\$17.8) \$17.3 \$101.3 \$113.0 \$(\$12.7) \$(\$3.8) \$96.5 105.09 DAY \$7.2 \$0.5 \$(\$3.2) \$1.1 \$5.5 \$16.1 \$(\$2.6) \$(\$0.7) \$12.8 \$42.89 \$(\$4.1) \$(\$1.1) \$23.7 \$225.59 DLCO \$9.1 \$50.0 \$(\$2.5) \$1.4 \$80.0 \$10.2 \$(\$1.9) \$(\$0.5) \$7.7 \$44.3 \$(\$18.7) \$9.4 \$42.3 \$84.4 \$(\$14.2) \$(\$4.0) \$66.2 \$63.99 DPL \$39.3 \$82 \$(\$3.4) \$7.0 \$51.0 \$63.0 \$(\$3.3) \$(\$0.7) \$59.0 \$65.8 \$(\$3.2) \$1.1 \$0.0 \$(\$2.3) \$11.8 \$(\$1.7) \$(\$0.5) \$9.5 \$0.0 \$(\$2.4) \$0.0 \$(\$2.3) \$11.8 \$(\$1.7) \$(\$0.5) \$9.5 \$0.0 \$(\$4.1) \$(\$1.1) \$23.7 \$25.99 \$(\$4.1) \$(\$1.1) \$23.7 \$25.99 \$(\$4.1) \$(\$1.1) \$23.7 \$225.59 \$(\$4.1) \$(\$4.1) \$(\$1.1) \$23.7 \$225.59 \$(\$4.1) |          |             |             |           |         |         |         |           |              |         |         |
|--|----------|-------------|-------------|-----------|---------|---------|---------|-----------|--------------|---------|---------|
| AECO \$4.9 \$0.0 (\$1.9) \$0.8 \$3.8 \$11.9 (\$1.5) (\$0.4) \$10.0 37.89 AEP \$56.8 \$38.9 (\$23.7) \$21.8 \$93.8 \$129.6 (\$18.9) (\$5.1) \$10.5 788.79 APS \$40.8 \$10.4 (\$9.2) \$8.9 \$50.9 \$53.7 (\$6.9) (\$2.0) \$44.8 \$113.69 APS \$43.3 \$0.3 (\$12.4) \$6.7 \$37.9 \$64.8 (\$9.7) (\$2.6) \$52.5 72.39 BGE \$67.2 \$1.5 (\$5.8) \$10.7 \$73.6 \$26.1 (\$4.8) (\$1.2) \$20.0 367.39 DAY \$7.2 \$0.5 (\$3.2) \$1.1 \$5.5 \$16.1 (\$2.6) (\$0.7) \$12.8 \$42.8 DAY \$7.2 \$0.5 (\$3.2) \$1.1 \$5.5 \$16.1 (\$2.6) (\$0.7) \$12.8 \$42.8 DEOK \$41.5 \$9.1 (\$5.0) \$7.7 \$53.4 \$28.9 (\$4.1) (\$1.1) \$23.7 \$225.59 DLCO \$9.1 \$0.0 (\$2.5) \$1.4 \$8.0 \$10.2 (\$1.9) (\$0.5) \$7.7 \$10.2 \$25.5 DLCO \$9.1 \$0.0 (\$2.5) \$1.4 \$8.0 \$10.2 (\$1.9) (\$0.5) \$7.7 \$10.4.29 Deminion \$7.1 \$44.3 (\$18.7) \$9.4 \$42.3 \$84.4 (\$14.2) (\$4.0) \$66.2 63.99 DPL \$39.3 \$82 (\$3.4) \$7.0 \$51.0 \$63.0 (\$3.3) (\$0.7) \$59.0 \$65.2 \$10.9 (\$0.5) \$7.7 \$40.20 \$11.8 \$11.8 (\$1.7) \$11.8 \$11.8 \$11.8 \$11.8 \$11.8 \$11.9 \$11.8 \$11.8 \$11.9 \$11.8 \$11.9 \$11.8 \$11.9 \$11.1 \$11.9 \$11.9 \$11.9 \$11.9 \$11.1 \$11.9 \$11.9 \$11.1 \$11.9 \$11.9 \$11.1 \$11.9 \$11.9 \$11.1 \$11.9 \$11.9 \$11.1 \$11.9 \$11.9 \$11.1 \$11.9 \$11.9 \$11.9 \$11.1 \$11.9 \$   | Zone     | ARR Credits | FTR Credits |           |         |         | •       | _         | M2M Payments |         | Offset  |
| AEP \$56.8 \$38.9 \$(\$23.7) \$21.8 \$93.8 \$129.6 \$(\$18.9) \$(\$5.1) \$105.7 88.79 APS \$40.8 \$10.4 \$(\$9.2) \$8.9 \$50.9 \$53.7 \$(\$6.9) \$(\$2.0) \$44.8 113.69 BGE \$67.2 \$15.5 \$(\$5.8) \$10.7 \$73.6 \$26.1 \$(\$4.8) \$(\$1.2) \$20.0 \$367.39 BGE \$67.2 \$15.5 \$(\$5.8) \$10.7 \$73.6 \$26.1 \$(\$4.8) \$(\$1.2) \$20.0 \$367.39 BGE \$91.7 \$10.2 \$(\$17.8) \$17.3 \$101.3 \$113.0 \$(\$12.7) \$(\$3.8) \$96.5 \$105.09 BAY \$7.2 \$0.5 \$(\$3.2) \$1.1 \$5.5 \$16.1 \$(\$2.6) \$(\$0.7) \$12.8 \$42.89 BEC \$91.7 \$10.2 \$(\$17.8) \$17.3 \$101.3 \$113.0 \$(\$12.7) \$(\$3.8) \$96.5 \$105.09 BAY \$7.2 \$0.5 \$(\$3.2) \$1.1 \$5.5 \$16.1 \$(\$2.6) \$(\$0.7) \$12.8 \$42.89 \$(\$4.1) \$(\$1.1) \$23.7 \$225.59 BCC \$91.0 \$91.1 \$0.0 \$(\$2.5) \$14.4 \$80.0 \$10.2 \$(\$1.9) \$(\$0.5) \$7.7 \$42.8 \$0.0 \$0.0 \$1.1 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0  |          |             |             |           |         |         |         |           |              |         | 37.8%   |
| ATSI \$43.3 \$0.3 \$(\$12.4) \$6.7 \$37.9 \$64.8 \$(\$9.7) \$(\$2.6) \$52.5 72.39 BGE \$67.2 \$1.5 \$(\$5.8) \$10.7 \$73.6 \$26.1 \$(\$4.8) \$(\$1.2) \$20.0 \$367.39 ComEd \$91.7 \$10.2 \$(\$17.8) \$17.3 \$101.3 \$113.0 \$(\$12.7) \$(\$3.8) \$96.5 \$105.09 DAY \$7.2 \$0.5 \$(\$3.2) \$1.1 \$5.5 \$16.1 \$(\$2.6) \$(\$0.7) \$12.8 \$42.89 DEOK \$41.5 \$9.1 \$(\$5.0) \$7.7 \$53.4 \$28.9 \$(\$4.1) \$(\$1.1) \$23.7 \$225.59 DLCO \$9.1 \$0.0 \$(\$2.5) \$1.4 \$8.0 \$10.2 \$(\$1.9) \$(\$0.5) \$7.7 \$104.29 Dominion \$7.1 \$44.3 \$(\$18.7) \$9.4 \$42.3 \$84.4 \$(\$14.2) \$(\$4.0) \$66.2 \$63.99 DPL \$39.3 \$8.2 \$(\$3.4) \$7.0 \$51.0 \$63.0 \$(\$3.3) \$(\$0.7) \$59.0 \$66.2 \$63.99 DPL \$39.3 \$82.2 \$(\$3.4) \$7.0 \$51.0 \$63.0 \$(\$3.3) \$(\$0.7) \$59.0 \$66.5 \$EXPC \$0.0 \$0.0 \$0.0 \$0.2.4 \$0.0 \$0.5 \$3.9 \$0.7 \$(\$4.8) \$0.0 \$(\$4.1) \$0.5 \$9.5 \$0.0 \$0.0 \$0.0 \$0.5 \$3.9 \$0.7 \$(\$4.8) \$0.0 \$(\$4.1) \$058.89 \$0.0 \$4.10 \$058.89 \$0.0 \$4.10 \$058.89 \$0.0 \$4.10 \$058.89 \$0.0 \$4.20 \$0.0 \$0.0 \$0.5 \$3.9 \$0.7 \$(\$4.8) \$0.0 \$0.0 \$4.2 \$0.0 \$0.0 \$0.5 \$3.9 \$0.7 \$(\$4.8) \$0.0 \$0.0 \$4.2 \$0.0 \$0.0 \$0.5 \$3.9 \$0.7 \$(\$4.8) \$0.0 \$0.0 \$4.2 \$0.0 \$0.0 \$0.5 \$3.9 \$0.7 \$(\$4.8) \$0.0 \$0.0 \$4.2 \$0.0 \$0.0 \$0.5 \$3.9 \$0.7 \$0.0 \$0.0 \$0.0 \$0.1 \$0.0 \$0.0 \$0.5 \$0.0 \$0.0 \$0.5 \$0.0 \$0.0   | AEP      | \$56.8      | \$38.9      |           |         | \$93.8  | \$129.6 |           | (\$5.1)      | \$105.7 | 88.7%   |
| BGE     \$67.2     \$1.5     (\$5.8)     \$10.7     \$73.6     \$26.1     (\$4.8)     (\$1.2)     \$20.0     367.39       ComEd     \$91.7     \$10.2     (\$17.8)     \$17.3     \$101.3     \$113.0     (\$12.7)     (\$3.8)     \$96.5     105.09       DAY     \$7.2     \$0.5     (\$3.2)     \$1.1     \$5.5     \$16.1     (\$2.6)     (\$0.77)     \$12.8     42.89       DEOK     \$41.5     \$9.1     (\$5.0)     \$7.7     \$53.4     \$28.9     (\$4.1)     (\$1.1)     \$22.5.9       DLCO     \$9.1     \$0.0     (\$2.5)     \$1.4     \$8.0     \$10.2     (\$1.9)     (\$0.5)     \$7.7     \$104.29     \$9.0     \$0.5     \$7.7     \$104.29     \$9.0     \$0.5     \$7.7     \$104.29     \$9.0     \$0.5     \$7.7     \$104.29     \$9.0     \$0.5     \$7.7     \$104.29     \$9.0     \$0.5     \$9.7     \$104.29     \$9.0     \$9.0     \$9.0     \$9.0     \$9.0     \$9.0     \$9.0     \$9.0     \$9.0     \$9.0     \$9.0   | APS      | \$40.8      | \$10.4      | (\$9.2)   | \$8.9   | \$50.9  | \$53.7  | (\$6.9)   | (\$2.0)      | \$44.8  | 113.6%  |
| ComEd     \$91.7     \$10.2     (\$17.8)     \$17.3     \$101.3     \$113.0     (\$12.7)     (\$3.8)     \$96.5     105.09       DAY     \$7.2     \$0.5     (\$3.2)     \$1.1     \$5.5     \$16.1     (\$2.6)     (\$0.7)     \$12.8     42.89       DEOK     \$41.5     \$9.1     (\$5.0)     \$7.7     \$53.4     \$28.9     (\$4.1)     (\$1.1)     \$23.7     \$25.59       DLCO     \$9.1     \$0.0     (\$2.5)     \$1.4     \$8.0     \$10.2     (\$1.9)     (\$0.5)     \$7.7     104.29       Dominion     \$7.1     \$44.3     (\$18.7)     \$9.4     \$42.3     \$84.4     (\$14.2)     (\$4.0)     \$66.2     63.99       DPL     \$39.3     \$8.2     (\$3.4)     \$7.0     \$51.0     \$63.0     (\$3.3)     (\$0.7)     \$59.0     86.59       EKPC     \$0.0     \$0.0     \$2.4     \$0.0     (\$2.3)     \$11.8     (\$1.7)     (\$0.5)     \$9.5     \$24.1%       EXT     \$3.4     \$0.0     \$0.5     \$3.9     \$0.   | ATSI     | \$43.3      | \$0.3       | (\$12.4)  | \$6.7   | \$37.9  | \$64.8  | (\$9.7)   | (\$2.6)      | \$52.5  | 72.3%   |
| DAY     \$7.2     \$0.5     (\$3.2)     \$1.1     \$5.5     \$16.1     (\$2.6)     (\$0.7)     \$12.8     42.89       DEOK     \$41.5     \$9.1     (\$5.0)     \$7.7     \$53.4     \$28.9     (\$4.1)     (\$1.1)     \$23.7     \$25.59       DLCO     \$9.1     \$0.0     (\$2.5)     \$1.4     \$8.0     \$10.2     (\$1.9)     (\$0.5)     \$7.7     104.29       Dominion     \$7.1     \$44.3     (\$18.7)     \$9.4     \$42.3     \$84.4     (\$14.2)     (\$4.0)     \$66.2     63.99       DPL     \$39.3     \$8.2     (\$3.4)     \$7.0     \$51.0     \$63.0     (\$3.3)     (\$0.7)     \$59.0     86.59       EKPC     \$0.0     \$0.0     (\$2.4)     \$0.0     (\$2.3)     \$11.8     (\$1.7)     (\$0.5)     \$9.5     (\$24.19       EXT     \$3.4     \$0.0     \$0.5     \$3.9     \$0.7     \$4.8)     \$0.0     (\$4.1)     \$95.89       JCPL     \$2.5     \$0.0     (\$4.2)     \$0.4     (\$1.3)     \$24.6   | BGE      | \$67.2      | \$1.5       | (\$5.8)   | \$10.7  | \$73.6  | \$26.1  | (\$4.8)   | (\$1.2)      | \$20.0  | 367.3%  |
| DEOK     \$41.5     \$9.1     (\$5.0)     \$7.7     \$53.4     \$28.9     (\$4.1)     (\$1.1)     \$23.7     \$25.59       DLCO     \$9.1     \$0.0     (\$2.5)     \$1.4     \$8.0     \$10.2     (\$1.9)     (\$0.5)     \$7.7     104.29       Dominion     \$7.1     \$44.3     (\$18.7)     \$9.4     \$42.3     \$84.4     (\$14.2)     (\$4.0)     \$66.2     63.99       DPL     \$39.3     \$8.2     (\$3.4)     \$7.0     \$51.0     \$63.0     (\$3.3)     (\$0.7)     \$59.0     86.59       EKPC     \$0.0     \$0.0     (\$2.4)     \$0.0     (\$2.3)     \$11.8     (\$1.7)     (\$0.5)     \$9.5     (24.1%       EXT     \$3.4     \$0.0     \$0.0     \$0.5     \$3.9     \$0.7     (\$4.8)     \$0.0     (\$4.1)     (\$95.8%       JCPL     \$2.5     \$0.0     (\$4.2)     \$0.4     (\$1.3)     \$24.6     (\$3.3)     (\$0.9)     \$20.4     (6.2%       Met-Ed     \$7.9     \$0.4     (\$2.9)     \$1.3     \$6.6 </td <td>ComEd</td> <td>\$91.7</td> <td>\$10.2</td> <td>(\$17.8)</td> <td>\$17.3</td> <td>\$101.3</td> <td>\$113.0</td> <td>(\$12.7)</td> <td>(\$3.8)</td> <td>\$96.5</td> <td>105.0%</td>  | ComEd    | \$91.7      | \$10.2      | (\$17.8)  | \$17.3  | \$101.3 | \$113.0 | (\$12.7)  | (\$3.8)      | \$96.5  | 105.0%  |
| DLCO     \$9.1     \$0.0     (\$2.5)     \$1.4     \$8.0     \$10.2     (\$1.9)     (\$0.5)     \$7.7     104.29       Dominion     \$7.1     \$44.3     (\$18.7)     \$9.4     \$42.3     \$84.4     (\$14.2)     (\$4.0)     \$66.2     63.99       DPL     \$39.3     \$8.2     (\$3.4)     \$7.0     \$51.0     \$63.0     (\$3.3)     (\$0.7)     \$59.0     86.59       EKPC     \$0.0     \$0.0     (\$2.4)     \$0.0     (\$2.3)     \$11.8     (\$1.7)     (\$0.5)     \$9.5     (24.1%       EXT     \$3.4     \$0.0     \$0.5     \$3.9     \$0.7     (\$4.8)     \$0.0     (\$4.1)     (95.8%       JCPL     \$2.5     \$0.0     \$0.5     \$3.9     \$0.7     \$4.8     \$0.0     \$4.1)     (95.8%       JCPL     \$2.5     \$0.0     \$0.4     \$0.4     \$1.3)     \$24.6     \$3.3)     \$0.0     \$4.1)     (95.8%       Met-Ed     \$7.9     \$0.4     \$2.9)     \$1.3     \$6.6     \$17.9     \$2.6) <t< td=""><td>DAY</td><td>\$7.2</td><td>\$0.5</td><td>(\$3.2)</td><td>\$1.1</td><td>\$5.5</td><td>\$16.1</td><td>(\$2.6)</td><td>(\$0.7)</td><td>\$12.8</td><td>42.8%</td></t<>   | DAY      | \$7.2       | \$0.5       | (\$3.2)   | \$1.1   | \$5.5   | \$16.1  | (\$2.6)   | (\$0.7)      | \$12.8  | 42.8%   |
| Dominion     \$7.1     \$44.3     (\$18.7)     \$9.4     \$42.3     \$84.4     (\$14.2)     (\$4.0)     \$66.2     63.99       DPL     \$39.3     \$8.2     (\$3.4)     \$7.0     \$51.0     \$63.0     (\$3.3)     (\$0.7)     \$59.0     86.59       EKPC     \$0.0     \$0.0     (\$2.4)     \$0.0     (\$2.3)     \$11.8     (\$1.7)     (\$0.5)     \$9.5     (24.1%       EXT     \$3.4     \$0.0     \$0.5     \$3.9     \$0.7     (\$4.8)     \$0.0     (\$4.1)     (\$95.8%       JCPL     \$2.5     \$0.0     (\$4.2)     \$0.4     (\$1.3)     \$24.6     (\$3.3)     (\$0.9)     \$20.4     (6.2%       Met-Ed     \$7.9     \$0.4     (\$2.9)     \$1.3     \$6.6     \$17.9     (\$2.6)     (\$0.6)     \$14.6     45.29       PECO     \$21.2     \$0.2     (\$7.5)     \$3.3     \$17.2     \$37.3     (\$5.7)     (\$1.6)     \$30.0     \$7.39       Penelec     \$10.9     \$4.0     (\$3.2)     \$2.0     \$13.7     \$2   | DEOK     | \$41.5      | \$9.1       | (\$5.0)   | \$7.7   | \$53.4  | \$28.9  | (\$4.1)   | (\$1.1)      | \$23.7  | 225.5%  |
| DPL     \$39.3     \$8.2     (\$3.4)     \$7.0     \$51.0     \$63.0     (\$3.3)     (\$0.7)     \$59.0     \$65.90       EKPC     \$0.0     \$0.0     (\$2.4)     \$0.0     (\$2.3)     \$11.8     (\$1.7)     (\$0.5)     \$9.5     (24.1%       EXT     \$3.4     \$0.0     \$0.0     \$0.5     \$3.9     \$0.7     (\$4.8)     \$0.0     (\$4.1)     (95.8%       JCPL     \$2.5     \$0.0     (\$4.2)     \$0.4     (\$1.3)     \$24.6     (\$3.3)     (\$0.9)     \$20.4     (6.2%       Met-Ed     \$7.9     \$0.4     (\$2.9)     \$1.3     \$6.6     \$17.9     (\$2.6)     (\$0.6)     \$14.6     45.29       PECO     \$21.2     \$0.2     (\$7.5)     \$3.3     \$17.2     \$37.3     (\$5.7)     (\$1.6)     \$30.0     57.39       Penclec     \$10.9     \$4.0     (\$3.2)     \$2.0     \$13.7     \$21.7     (\$3.4)     (\$0.7)     \$17.6     77.79       Pepco     \$28.9     \$2.0     (\$5.5)     \$5.0     \$30.3 <td>DLCO</td> <td>\$9.1</td> <td>\$0.0</td> <td>(\$2.5)</td> <td>\$1.4</td> <td>\$8.0</td> <td>\$10.2</td> <td>(\$1.9)</td> <td>(\$0.5)</td> <td>\$7.7</td> <td>104.2%</td>   | DLCO     | \$9.1       | \$0.0       | (\$2.5)   | \$1.4   | \$8.0   | \$10.2  | (\$1.9)   | (\$0.5)      | \$7.7   | 104.2%  |
| EKPC     \$0.0     \$0.0     \$0.0     \$0.0     \$0.0     \$0.0     \$0.0     \$0.5     \$11.8     \$11.8     \$1.7     \$0.5     \$9.5     \$24.1%       EXT     \$3.4     \$0.0     \$0.0     \$0.5     \$3.9     \$0.7     \$4.8     \$0.0     \$4.1     \$95.8%       JCPL     \$2.5     \$0.0     \$0.4     \$0.4     \$1.3     \$24.6     \$3.3     \$0.9     \$20.4     \$6.2%       Met-Ed     \$7.9     \$0.4     \$2.9     \$1.3     \$6.6     \$17.9     \$2.6     \$0.6     \$14.6     45.29       PECO     \$21.2     \$0.2     \$0.75     \$3.3     \$17.2     \$37.3     \$5.7     \$1.6     \$30.0     \$7.39       Penelec     \$10.9     \$4.0     \$3.2     \$2.0     \$13.7     \$21.7     \$3.4     \$0.7     \$17.6     \$77.79       Pepco     \$28.9     \$2.0     \$5.5     \$5.0     \$30.3     \$23.6     \$4.2     \$18.2     \$166.39       PPL     \$4.4     \$0.0     \$6.3     \$39.2 </td <td>Dominion</td> <td>\$7.1</td> <td>\$44.3</td> <td>(\$18.7)</td> <td>\$9.4</td> <td>\$42.3</td> <td>\$84.4</td> <td>(\$14.2)</td> <td>(\$4.0)</td> <td>\$66.2</td> <td>63.9%</td>  | Dominion | \$7.1       | \$44.3      | (\$18.7)  | \$9.4   | \$42.3  | \$84.4  | (\$14.2)  | (\$4.0)      | \$66.2  | 63.9%   |
| EXT \$3.4 \$0.0 \$0.0 \$0.5 \$3.9 \$0.7 (\$4.8) \$0.0 (\$4.1) (95.8% JCPL \$2.5 \$0.0 (\$4.2) \$0.4 (\$1.3) \$24.6 (\$3.3) (\$0.9) \$20.4 (6.2% Met-Ed \$7.9 \$0.4 (\$2.9) \$1.3 \$6.6 \$17.9 (\$2.6) (\$0.6) \$14.6 45.29 PECO \$21.2 \$0.2 (\$7.5) \$3.3 \$17.2 \$37.3 (\$5.7) (\$1.6) \$30.0 57.39 Penelec \$10.9 \$4.0 (\$3.2) \$2.0 \$13.7 \$21.7 (\$3.4) (\$0.7) \$17.6 77.79 Pepco \$28.9 \$2.0 (\$5.5) \$5.0 \$30.3 \$23.6 (\$4.2) (\$1.2) \$18.2 166.39 PPL \$4.4 \$0.0 (\$7.6) \$0.7 (\$2.4) \$44.2 (\$5.9) (\$1.6) \$36.7 (6.7% PSEG \$40.9 \$0.0 (\$8.1) \$6.3 \$39.2 \$47.3 (\$7.0) (\$1.7) \$38.6 101.59 RECO \$0.1 \$0.0 (\$0.3) \$0.0 (\$0.2) \$2.0 (\$0.9) (\$0.1) \$1.1 (19.0% PRECO \$0.1]  | DPL      | \$39.3      | \$8.2       | (\$3.4)   | \$7.0   | \$51.0  | \$63.0  | (\$3.3)   | (\$0.7)      | \$59.0  | 86.5%   |
| JCPL     \$2.5     \$0.0     (\$4.2)     \$0.4     (\$1.3)     \$24.6     (\$3.3)     (\$0.9)     \$20.4     (6.2%       Met-Ed     \$7.9     \$0.4     (\$2.9)     \$1.3     \$6.6     \$17.9     (\$2.6)     (\$0.6)     \$14.6     45.29       PECO     \$21.2     \$0.2     (\$7.5)     \$3.3     \$17.2     \$37.3     (\$5.7)     (\$1.6)     \$30.0     57.39       Penelec     \$10.9     \$4.0     (\$3.2)     \$2.0     \$13.7     \$21.7     (\$3.4)     (\$0.7)     \$17.6     77.79       Pepco     \$28.9     \$2.0     (\$5.5)     \$5.0     \$30.3     \$23.6     (\$4.2)     (\$1.2)     \$18.2     166.39       PPL     \$4.4     \$0.0     (\$7.6)     \$0.7     (\$2.4)     \$44.2     (\$5.9)     (\$1.6)     \$36.7     (6.7%       PSEG     \$40.9     \$0.0     (\$8.1)     \$6.3     \$39.2     \$47.3     (\$7.0)     (\$1.7)     \$38.6     101.59       RECO     \$0.1     \$0.0     (\$0.3)     \$0.0     (\$   | EKPC     | \$0.0       | \$0.0       | (\$2.4)   | \$0.0   | (\$2.3) | \$11.8  | (\$1.7)   | (\$0.5)      | \$9.5   | (24.1%) |
| Met-Ed     \$7.9     \$0.4     (\$2.9)     \$1.3     \$6.6     \$17.9     (\$2.6)     (\$0.6)     \$14.6     45.29       PECO     \$21.2     \$0.2     (\$7.5)     \$3.3     \$17.2     \$37.3     (\$5.7)     (\$1.6)     \$30.0     57.39       Penelec     \$10.9     \$4.0     (\$3.2)     \$2.0     \$13.7     \$21.7     (\$3.4)     (\$0.7)     \$17.6     77.79       Pepco     \$28.9     \$2.0     (\$5.5)     \$5.0     \$30.3     \$23.6     (\$4.2)     (\$1.2)     \$18.2     166.39       PPL     \$4.4     \$0.0     (\$7.6)     \$0.7     (\$2.4)     \$44.2     (\$5.9)     (\$1.6)     \$36.7     (6.7%       PSEG     \$40.9     \$0.0     (\$8.1)     \$6.3     \$39.2     \$47.3     (\$7.0)     (\$1.7)     \$38.6     101.59       RECO     \$0.1     \$0.0     (\$0.3)     \$0.0     (\$0.2)     \$2.0     (\$0.9)     (\$0.1)     \$1.1     (19.0%   | EXT      | \$3.4       | \$0.0       | \$0.0     | \$0.5   | \$3.9   | \$0.7   | (\$4.8)   | \$0.0        | (\$4.1) | (95.8%) |
| PECO     \$21.2     \$0.2     \$(\$7.5)     \$3.3     \$17.2     \$37.3     \$(\$5.7)     \$(\$1.6)     \$30.0     57.39       Penelec     \$10.9     \$4.0     \$(\$3.2)     \$2.0     \$13.7     \$21.7     \$(\$3.4)     \$(\$0.7)     \$17.6     77.79       Pepco     \$28.9     \$2.0     \$(\$5.5)     \$5.0     \$30.3     \$23.6     \$(\$4.2)     \$18.2     \$18.2     \$166.39       PPL     \$4.4     \$0.0     \$0.7     \$2.4     \$44.2     \$5.9     \$1.6     \$36.7     \$6.7%       PSEG     \$40.9     \$0.0     \$6.3     \$39.2     \$47.3     \$7.0     \$1.7     \$38.6     \$101.59       RECO     \$0.1     \$0.0     \$0.3     \$0.0     \$2.0     \$2.0     \$0.9     \$0.1     \$1.1     \$1.9   | JCPL     | \$2.5       | \$0.0       | (\$4.2)   | \$0.4   | (\$1.3) | \$24.6  | (\$3.3)   | (\$0.9)      | \$20.4  | (6.2%)  |
| Penelec     \$10.9     \$4.0     (\$3.2)     \$2.0     \$13.7     \$21.7     (\$3.4)     (\$0.7)     \$17.6     77.79       Pepco     \$28.9     \$2.0     (\$5.5)     \$5.0     \$30.3     \$23.6     (\$4.2)     (\$1.2)     \$18.2     166.39       PPL     \$4.4     \$0.0     (\$7.6)     \$0.7     (\$2.4)     \$44.2     (\$5.9)     (\$1.6)     \$36.7     (6.7%       PSEG     \$40.9     \$0.0     (\$8.1)     \$6.3     \$39.2     \$47.3     (\$7.0)     (\$1.7)     \$38.6     101.59       RECO     \$0.1     \$0.0     (\$0.3)     \$0.0     (\$0.2)     \$2.0     (\$0.9)     (\$0.1)     \$1.1     (19.0%)  | Met-Ed   | \$7.9       | \$0.4       | (\$2.9)   | \$1.3   | \$6.6   | \$17.9  | (\$2.6)   | (\$0.6)      | \$14.6  | 45.2%   |
| Pepco     \$28.9     \$2.0     (\$5.5)     \$5.0     \$30.3     \$23.6     (\$4.2)     (\$1.2)     \$18.2     166.39       PPL     \$4.4     \$0.0     (\$7.6)     \$0.7     (\$2.4)     \$44.2     (\$5.9)     (\$1.6)     \$36.7     (6.7%       PSEG     \$40.9     \$0.0     (\$8.1)     \$6.3     \$39.2     \$47.3     (\$7.0)     (\$1.7)     \$38.6     101.59       RECO     \$0.1     \$0.0     (\$0.3)     \$0.0     (\$0.2)     \$2.0     (\$0.9)     (\$0.1)     \$1.1     (19.0%)  | PECO     | \$21.2      | \$0.2       | (\$7.5)   | \$3.3   | \$17.2  | \$37.3  | (\$5.7)   | (\$1.6)      | \$30.0  | 57.3%   |
| PPL \$4.4 \$0.0 \$0.7 \$2.4 \$44.2 \$5.9 \$36.7 \$6.7%   PSEG \$40.9 \$0.0 \$6.3 \$39.2 \$47.3 \$7.0 \$1.7 \$38.6 101.59   RECO \$0.1 \$0.0 \$0.3 \$0.0 \$2.0 \$2.0 \$0.9 \$0.1 \$1.1 \$1.90%  | Penelec  | \$10.9      | \$4.0       | (\$3.2)   | \$2.0   | \$13.7  | \$21.7  | (\$3.4)   | (\$0.7)      | \$17.6  | 77.7%   |
| PSEG \$40.9 \$0.0 (\$8.1) \$6.3 \$39.2 \$47.3 (\$7.0) (\$1.7) \$38.6 101.59 RECO \$0.1 \$0.0 (\$0.3) \$0.0 (\$0.2) \$2.0 (\$0.9) (\$0.1) \$1.1 (19.0%)   | Pepco    | \$28.9      | \$2.0       | (\$5.5)   | \$5.0   | \$30.3  | \$23.6  | (\$4.2)   | (\$1.2)      | \$18.2  | 166.3%  |
| RECO \$0.1 \$0.0 (\$0.3) \$0.0 (\$0.2) \$2.0 (\$0.9) (\$0.1) \$1.1 (19.0%)   | PPL      | \$4.4       | \$0.0       | (\$7.6)   | \$0.7   | (\$2.4) | \$44.2  | (\$5.9)   | (\$1.6)      | \$36.7  | (6.7%)  |
|  | PSEG     | \$40.9      | \$0.0       | (\$8.1)   | \$6.3   | \$39.2  | \$47.3  | (\$7.0)   | (\$1.7)      | \$38.6  | 101.5%  |
| Total \$529.0 \$130.1 (\$145.2) \$112.3 \$626.2 \$832.7 (\$120.0) (\$31.1) \$681.6 91.99   | RECO     | \$0.1       | \$0.0       | (\$0.3)   | \$0.0   | (\$0.2) | \$2.0   | (\$0.9)   | (\$0.1)      | \$1.1   | (19.0%) |
|  | Total    | \$529.0     | \$130.1     | (\$145.2) | \$112.3 | \$626.2 | \$832.7 | (\$120.0) | (\$31.1)     | \$681.6 | 91.9%   |



## Zonal Offset 17/18 Actual (Surplus not allocated to load)

| Zono         | ARR Credits | FTR Credits | Balancing+<br>M2M Charge | Surplus<br>Allocation | Total Offset | Day Ahead<br>Congestion | Balancing<br>Congestion | M2M                 | Total<br>Congestion | Offset  |
|--------------|-------------|-------------|--------------------------|-----------------------|--------------|-------------------------|-------------------------|---------------------|---------------------|---------|
| Zone<br>AECO | \$7.3       | \$0.0       | (\$1.6)                  | \$0.0                 | \$5.7        | \$15.9                  | (\$0.5)                 | Payments<br>(\$1.3) | \$14.2              | 73.9%   |
| AEP          | \$28.7      | \$171.5     | (\$20.4)                 | \$0.0                 | \$179.8      | \$223.1                 | (\$5.7)                 | (\$1.5)             | \$200.8             | 95.2%   |
| APS          | \$32.6      | \$20.2      | (\$20.4)                 | \$0.0                 | \$45.0       | \$67.2                  | (\$1.7)                 | (\$6.3)             | \$200.8<br>\$59.1   | 110.0%  |
| ATSI         |             |             | , ,                      |                       |              |                         | , ,                     | , ,                 |                     |         |
|              | \$15.1      | (\$0.1)     | (\$10.6)                 | \$0.0                 | \$4.4        | \$87.7                  | (\$3.1)                 | (\$8.6)             | \$75.9              | 18.8%   |
| BGE          | \$51.6      | \$2.9       | (\$5.0)                  | \$0.0                 | \$49.5       | \$50.0                  | (\$1.2)                 | (\$4.0)             | \$44.8              | 184.9%  |
| ComEd        | \$129.6     | \$17.4      | (\$15.4)                 | \$0.0                 | \$131.6      | \$205.3                 | (\$4.9)                 | (\$12.5)            | \$187.9             | 118.2%  |
| DAY          | \$2.3       | (\$0.9)     | (\$2.8)                  | \$0.0                 | (\$1.3)      | \$25.2                  | (\$0.6)                 | (\$2.2)             | \$22.4              | 2.0%    |
| DEOK         | \$10.4      | \$18.1      | (\$4.3)                  | \$0.0                 | \$24.1       | \$44.9                  | (\$0.3)                 | (\$3.5)             | \$41.1              | 67.1%   |
| DLCO         | \$4.3       | \$52.3      | (\$15.8)                 | \$0.0                 | \$40.9       | \$15.1                  | (\$0.5)                 | (\$1.8)             | \$139.9             | 19.4%   |
| Dominion     | \$34.6      | \$8.5       | (\$2.9)                  | \$0.0                 | \$40.2       | \$155.9                 | (\$3.3)                 | (\$12.8)            | \$56.5              | 41.8%   |
| DPL          | \$2.8       | \$0.1       | (\$2.2)                  | \$0.0                 | \$0.7        | \$48.9                  | \$10.0                  | (\$2.4)             | \$12.8              | 113.6%  |
| EKPC         | \$0.7       | (\$2.4)     | (\$2.1)                  | \$0.0                 | (\$3.8)      | \$23.5                  | (\$0.0)                 | (\$1.7)             | \$21.9              | (12.5%) |
| EXT          | \$1.2       | \$0.0       | \$0.0                    | \$0.0                 | \$1.2        | \$0.3                   | (\$3.8)                 | \$0.0               | (\$3.5)             | (59.5%) |
| JCPL         | \$3.9       | (\$0.0)     | (\$3.6)                  | \$0.0                 | \$0.3        | \$38.6                  | (\$0.9)                 | (\$2.9)             | \$34.8              | 8.1%    |
| Met-Ed       | \$8.2       | \$0.2       | (\$2.5)                  | \$0.0                 | \$6.0        | \$31.5                  | (\$2.1)                 | (\$2.0)             | \$27.4              | 41.6%   |
| PECO         | \$16.5      | \$0.1       | (\$6.4)                  | \$0.0                 | \$10.2       | \$65.5                  | (\$1.7)                 | (\$5.2)             | \$58.6              | 35.7%   |
| Penelec      | \$9.4       | \$0.9       | (\$2.7)                  | \$0.0                 | \$7.5        | \$30.7                  | (\$0.8)                 | (\$2.2)             | \$27.7              | 49.2%   |
| Pepco        | \$24.8      | \$2.8       | (\$4.8)                  | \$0.0                 | \$22.8       | \$46.4                  | (\$0.9)                 | (\$3.9)             | \$41.7              | 93.7%   |
| PPL          | (\$0.9)     | \$0.7       | (\$6.4)                  | \$0.0                 | (\$6.7)      | \$71.2                  | (\$0.9)                 | (\$5.2)             | \$65.1              | (10.5%) |
| PSEG         | \$44.2      | \$0.0       | (\$6.9)                  | \$0.0                 | \$37.3       | \$72.8                  | (\$1.7)                 | (\$5.6)             | \$65.5              | 100.6%  |
| RECO         | (\$0.1)     | \$0.0       | (\$0.2)                  | \$0.0                 | (\$0.3)      | \$2.3                   | (\$0.1)                 | (\$0.2)             | \$2.0               | (15.0%) |
| Total        | \$427.3     | \$292.2     | (\$124.3)                | \$0.0                 | \$595.2      | \$1,322.1               | (\$24.4)                | (\$100.9)           | \$1,196.8           | 49.7%   |

## Zonal Offset: All ARRs Self-Scheduled (Including IARR), ARR Only

|          | 16/17 PI      | lanning Period |        | 17/18 F       | Planning Period | 18/19 Planning Period |               |               |        |
|----------|---------------|----------------|--------|---------------|-----------------|-----------------------|---------------|---------------|--------|
|          | SS FTR        | Congestion     | Offset | SS FTR        | Congestion      | Offset                | SS FTR        | Congestion    | Offset |
| AECO     | \$3,021,689   | \$11,741,200   | 25.7%  | \$1,756,697   | \$15,437,400    | 11.4%                 | \$11,525,172  | \$10,416,500  | 110.6% |
| AEP      | \$85,681,538  | \$121,265,800  | 70.7%  | \$203,301,753 | \$217,384,700   | 93.5%                 | \$84,938,073  | \$110,740,100 | 76.7%  |
| APS      | \$25,526,131  | \$33,719,400   | 75.7%  | \$78,655,453  | \$65,480,700    | 120.1%                | \$37,381,074  | \$46,805,200  | 79.9%  |
| ATSI     | \$10,129,257  | \$52,917,900   | 19.1%  | \$54,097,113  | \$84,555,700    | 64.0%                 | \$45,315,660  | \$55,119,300  | 82.2%  |
| BGE      | \$100,805,106 | \$36,110,900   | 279.2% | \$83,097,233  | \$48,851,200    | 170.1%                | \$49,035,317  | \$21,287,600  | 230.3% |
| ComEd    | \$247,621,797 | \$211,702,700  | 117.0% | \$110,887,308 | \$200,428,700   | 55.3%                 | \$51,445,873  | \$100,361,400 | 51.3%  |
| DAY      | \$1,841,793   | \$14,131,300   | 13.0%  | \$10,531,674  | \$24,686,700    | 42.7%                 | \$11,196,523  | \$13,487,400  | 83.0%  |
| DEOK     | \$9,608,158   | \$27,103,700   | 35.4%  | \$72,152,140  | \$44,630,400    | 161.7%                | \$50,416,227  | \$24,742,200  | 203.8% |
| DLCO     | \$382,027     | \$9,293,800    | 4.1%   | \$10,562,209  | \$14,592,500    | 72.4%                 | \$7,234,008   | \$8,263,800   | 87.5%  |
| Dominion | \$49,442,578  | \$80,179,600   | 61.7%  | \$42,405,655  | \$152,675,600   | 27.8%                 | \$55,830,363  | \$70,199,000  | 79.5%  |
| DPL      | \$43,196,546  | \$39,505,200   | 109.3% | \$38,023,382  | \$58,901,700    | 64.6%                 | \$57,702,656  | \$59,742,200  | 96.6%  |
| EKPC     | (\$265,236)   | \$11,465,600   | -2.3%  | (\$3,507,456) | \$23,542,000    | -14.9%                | \$882,230     | \$10,051,300  | 8.8%   |
| EXT      | \$1,627,463   | (\$5,461,500)  | -29.8% | \$3,380,922   | (\$3,483,900)   | -97.0%                | \$1,672,545   | (\$4,118,000) | -40.6% |
| JCPL     | \$1,580,327   | \$18,648,300   | 8.5%   | \$2,700,148   | \$37,696,300    | 7.2%                  | \$2,617,822   | \$21,284,500  | 12.3%  |
| Met-Ed   | \$8,949,900   | \$17,241,300   | 51.9%  | \$7,558,664   | \$29,416,300    | 25.7%                 | \$5,004,146   | \$15,268,500  | 32.8%  |
| OVEC     | NA            | NA             | NA     | NA            | NA              | NA                    | NA            | \$75,400      | NA     |
| PECO     | \$9,882,927   | \$32,482,100   | 30.4%  | \$15,712,942  | \$63,774,900    | 24.6%                 | \$15,656,690  | \$31,603,100  | 49.5%  |
| PENELEC  | \$3,766,150   | \$14,569,000   | 25.9%  | \$15,442,708  | \$29,903,100    | 51.6%                 | \$17,497,247  | \$18,260,800  | 95.8%  |
| Pepco    | \$18,780,552  | \$27,031,100   | 69.5%  | \$38,062,128  | \$45,584,700    | 83.5%                 | \$19,541,345  | \$19,412,600  | 100.7% |
| PPL      | (\$2,363,170) | \$33,139,500   | -7.1%  | \$14,704,954  | \$70,348,700    | 20.9%                 | \$4,332,715   | \$38,278,200  | 11.3%  |
| PSEG     | \$18,579,476  | \$37,066,500   | 50.1%  | \$58,606,470  | \$71,100,300    | 82.4%                 | \$35,609,098  | \$40,339,500  | 88.3%  |
| RECO     | \$18,871      | \$1,418,900    | 1.3%   | (\$91,008)    | \$2,223,500     | -4.1%                 | \$163,246     | \$1,156,800   | 14.1%  |
| Total    | \$637,813,881 | \$825,272,300  | 77.3%  | \$858,041,090 | \$1,297,731,200 | 66.1%                 | \$564,998,030 | \$712,777,400 | 79.3%  |

Monitoring Analytics

Monitoring Analytics, LLC 2621 Van Buren Avenue Suite 160 Eagleville, PA 19403

(610) 271-8050

MA@monitoringanalytics.com

www.MonitoringAnalytics.com

