

Figure 1 a

Total Ancillary Service Costs Apr-Dec 1998

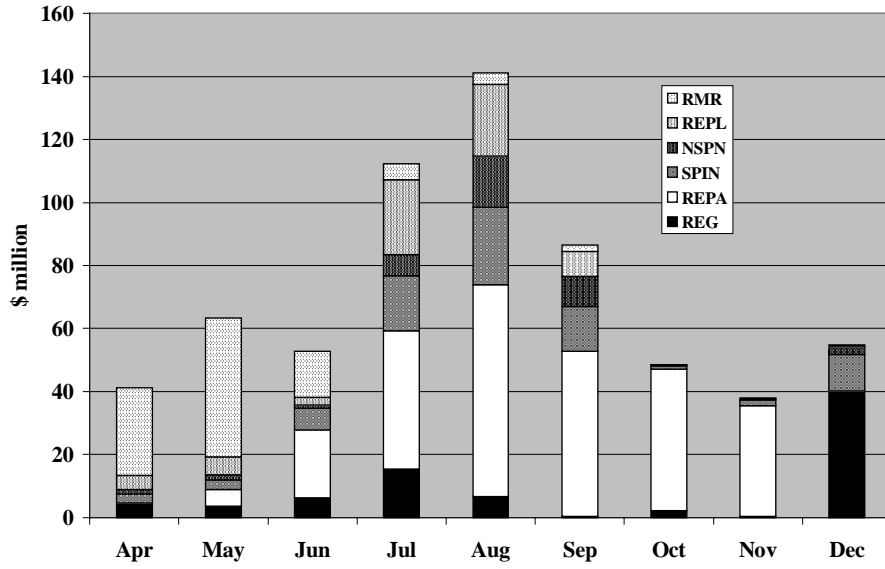


Figure 1 b

Daily Cost of Ancillary Services

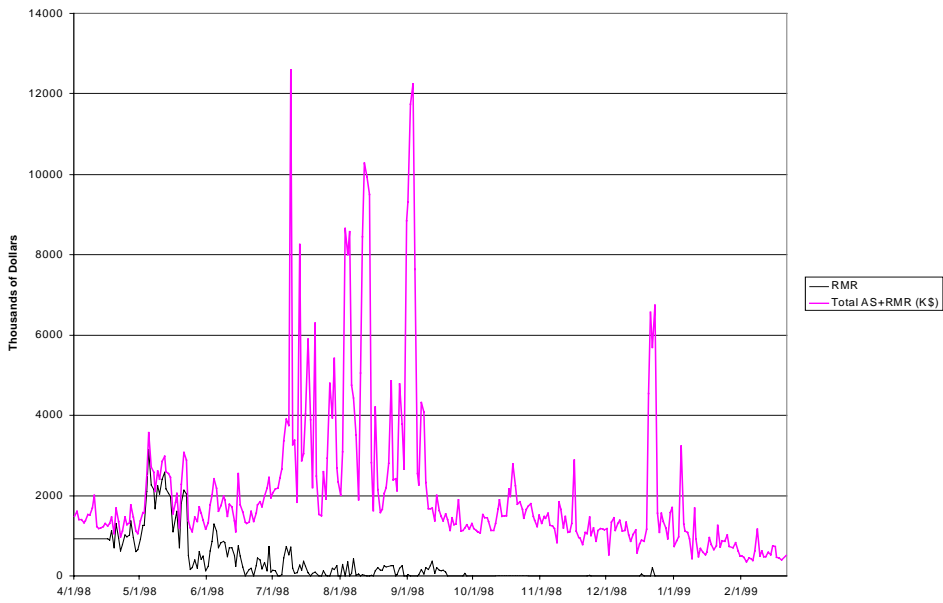


Figure 1 c

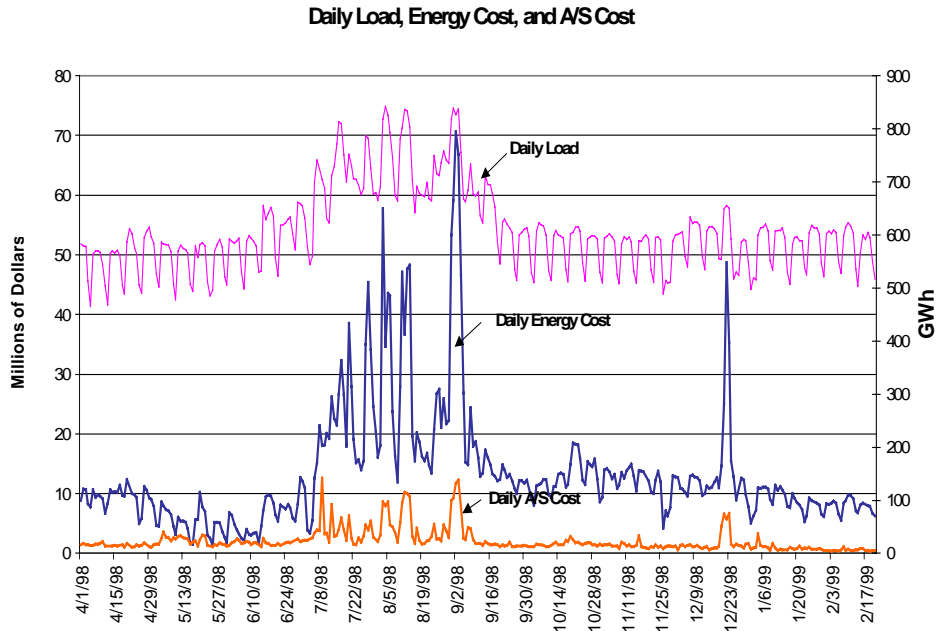


Figure 1 d

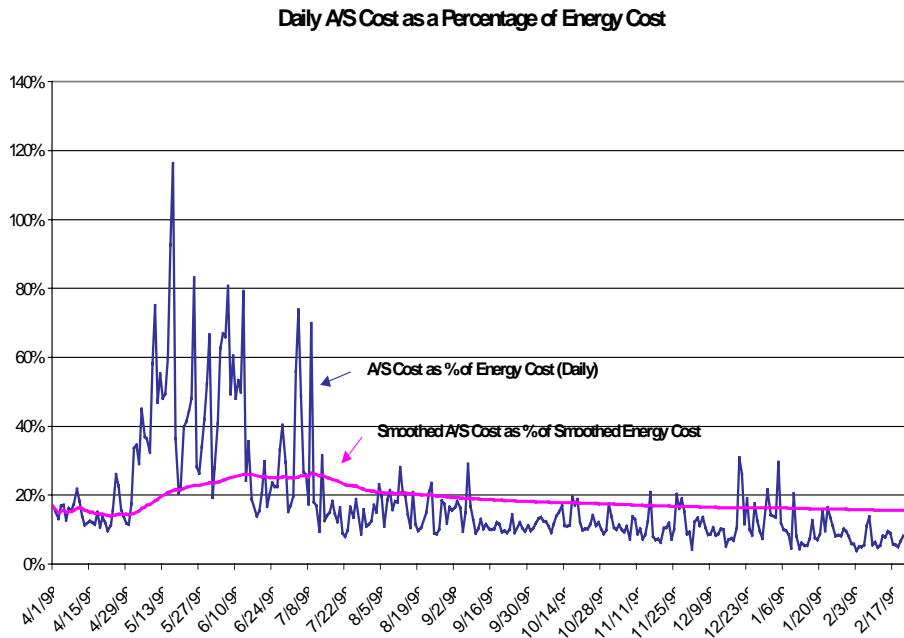


Figure 2 a

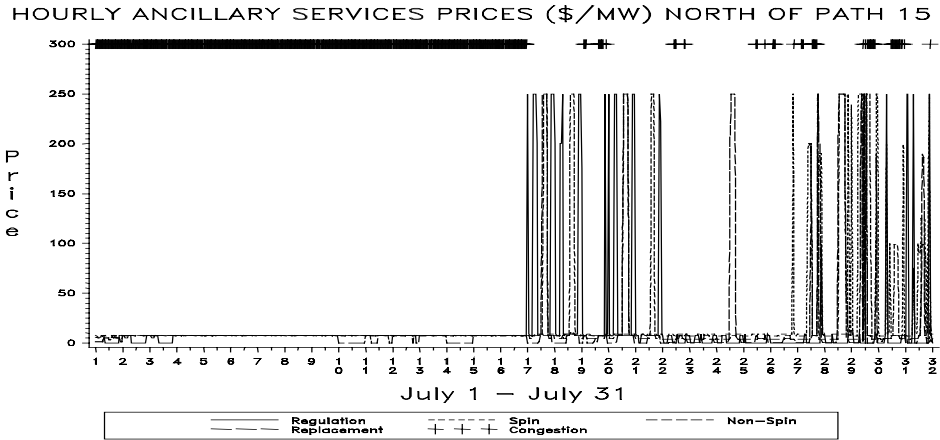


Figure 2 b

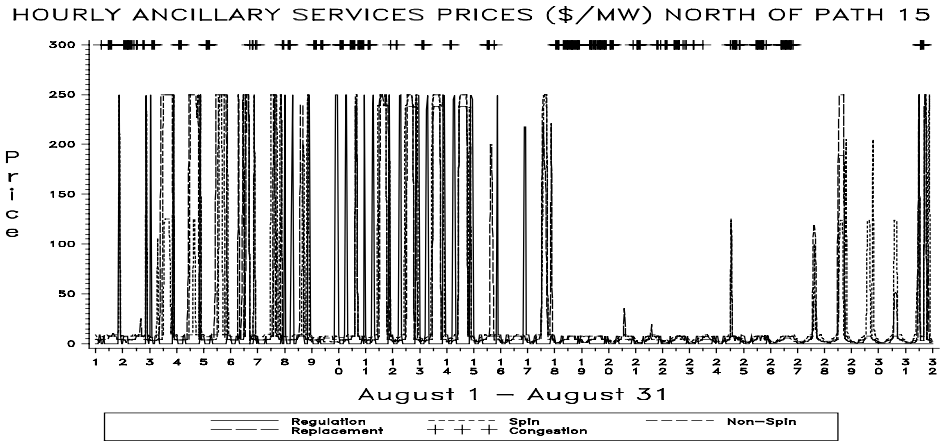


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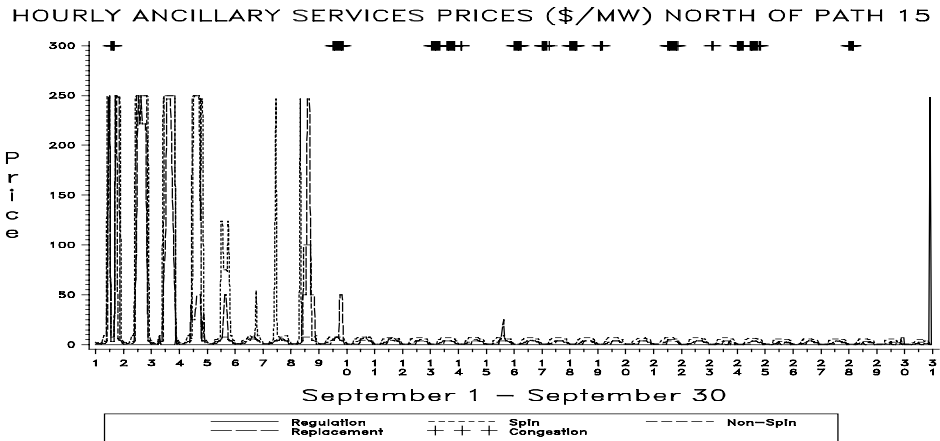


Figure 2 d

HOURLY ANCILLARY SERVICES PRICES (\$/MW) NORTH OF PATH 15

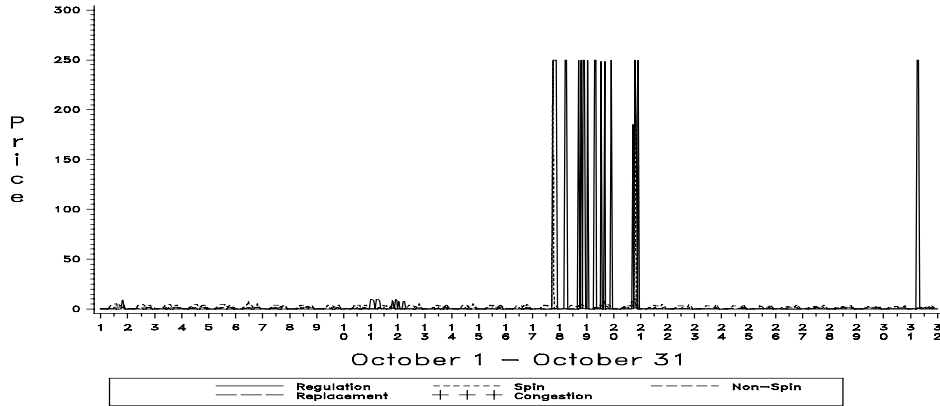


Figure 2 e

HOURLY ANCILLARY SERVICES PRICES (\$/MW) NORTH OF PATH 15

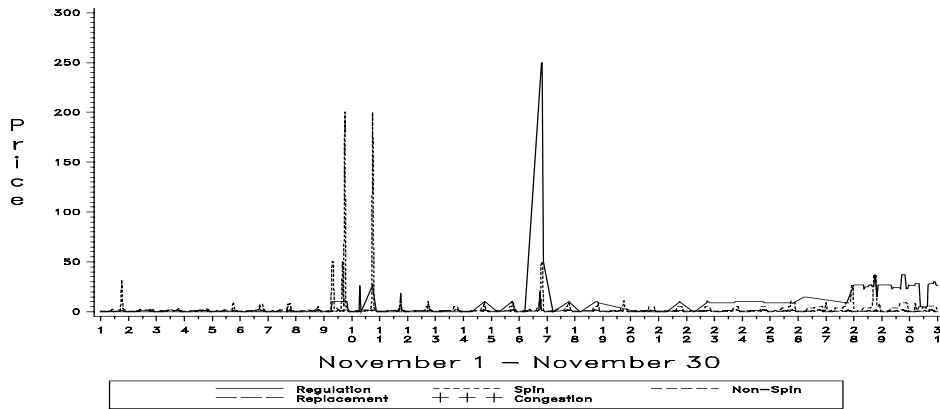


Figure 2 f

HOURLY ANCILLARY SERVICES PRICES (\$/MW) NORTH OF PATH 15

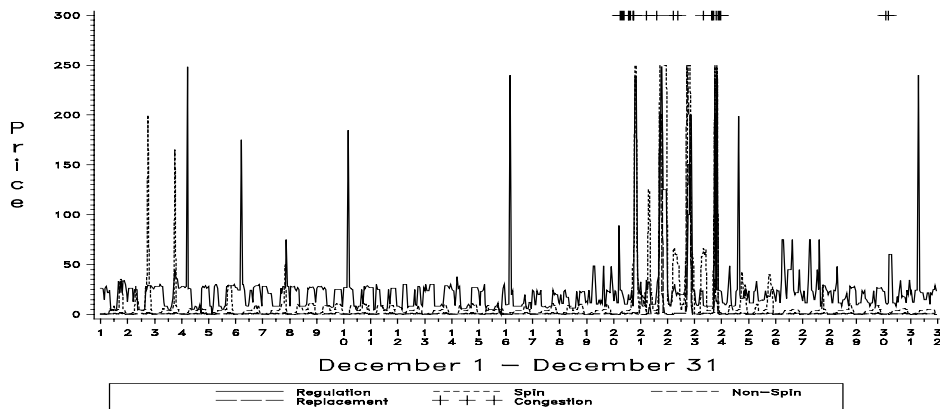


Figure 2 g

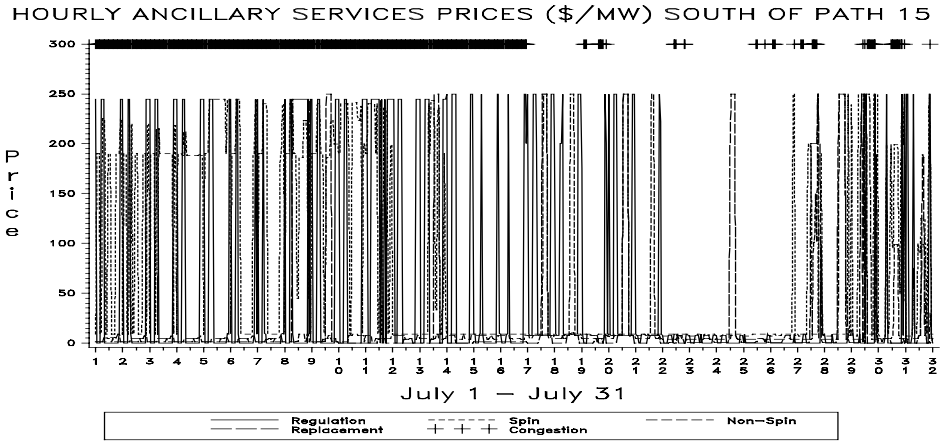


Figure 2 h

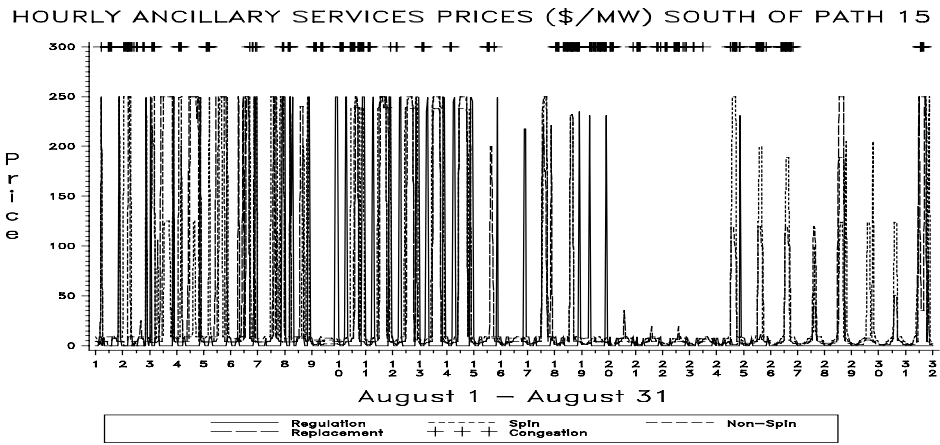


Figure 2 i

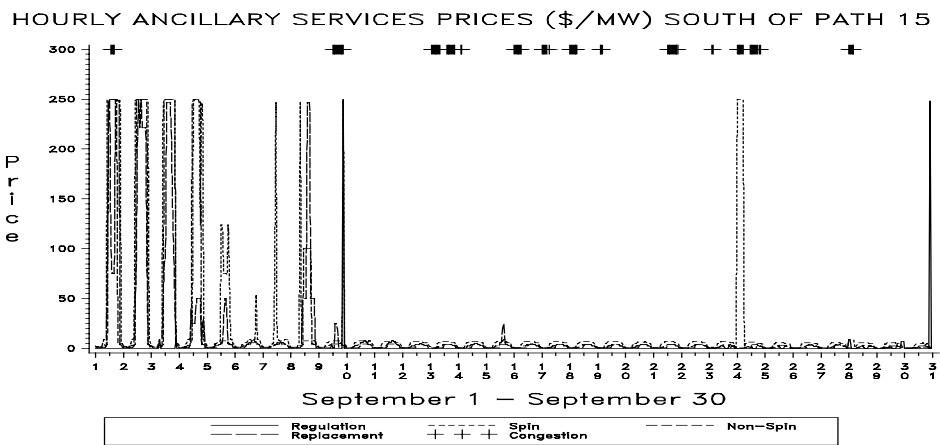


Figure 2 j

HOURLY ANCILLARY SERVICES PRICES (\$/MW) SOUTH OF PATH 15

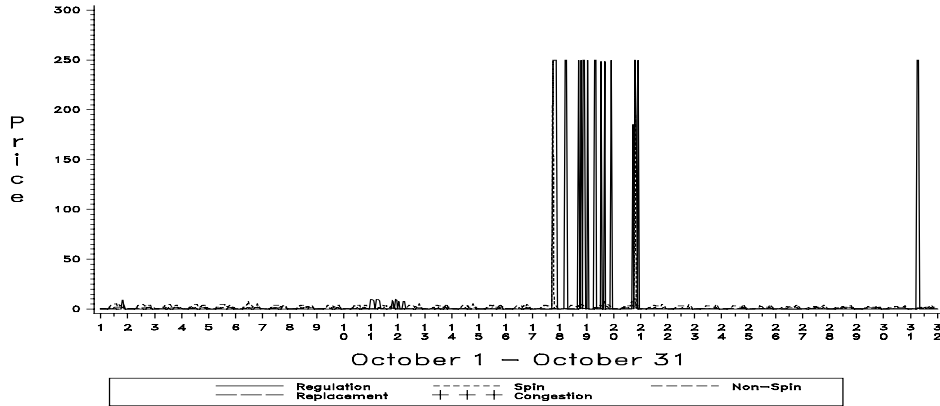


Figure 2 k

HOURLY ANCILLARY SERVICES PRICES (\$/MW) SOUTH OF PATH 15

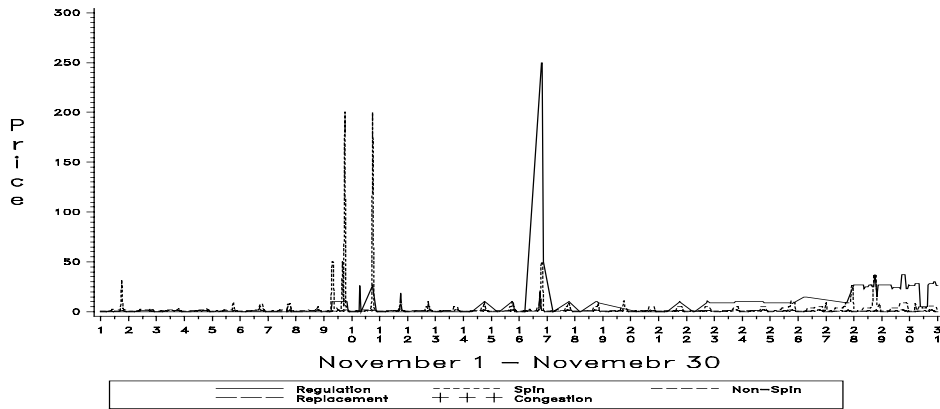


Figure 2 l

HOURLY ANCILLARY SERVICES PRICES (\$/MW) SOUTH OF PATH 15

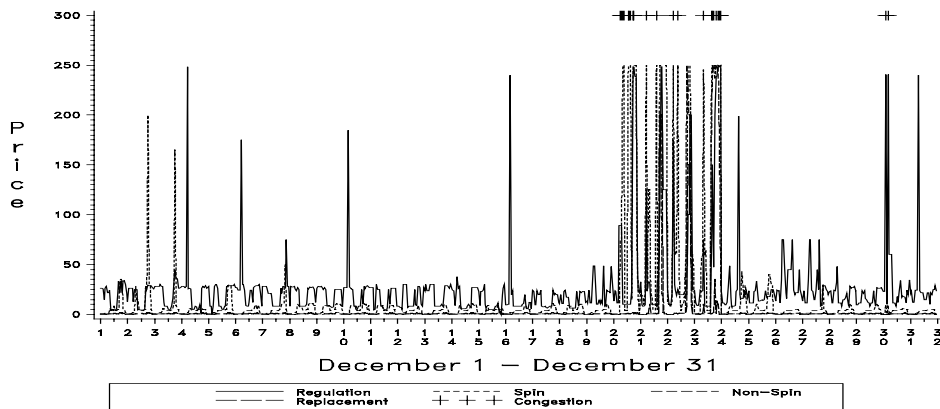


Figure 3 a

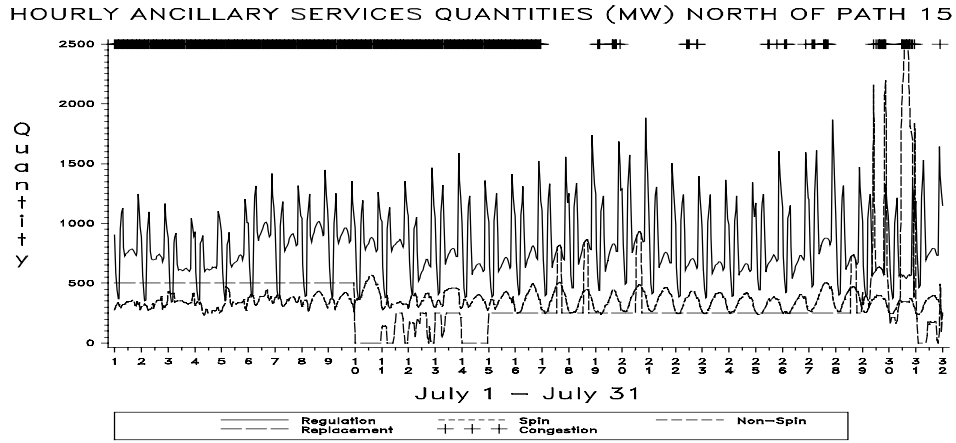


Figure 3 b

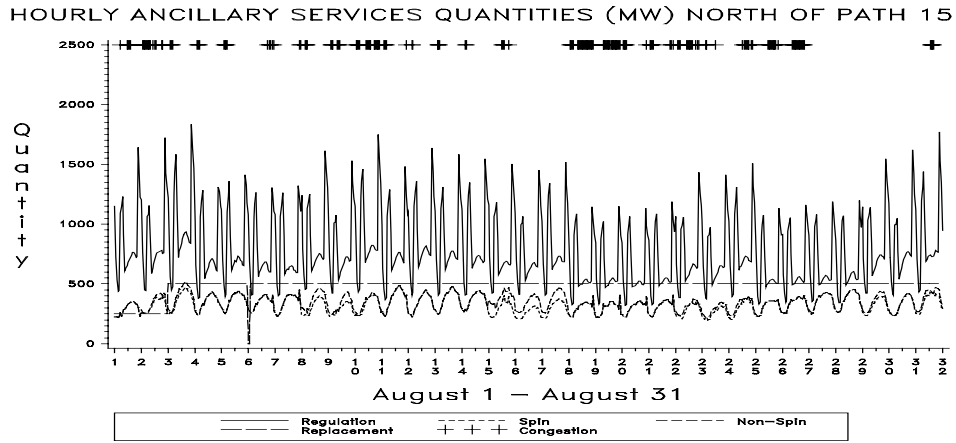


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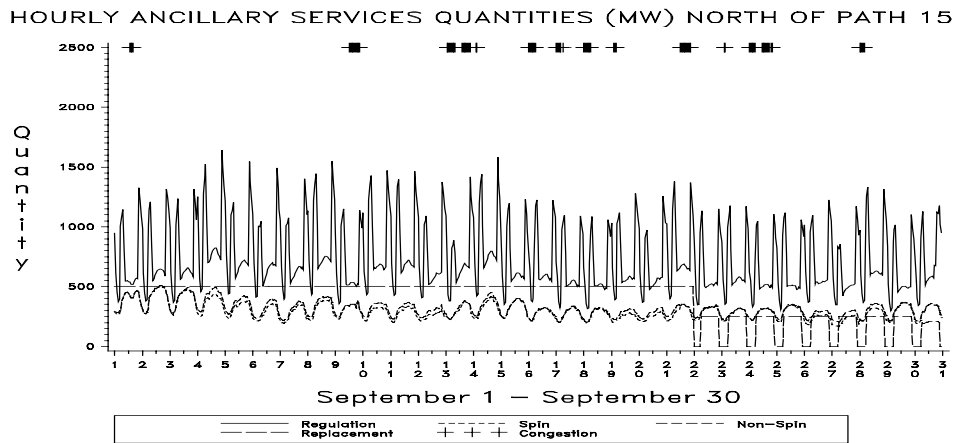


Figure 3 d

HOURLY ANCILLARY SERVICES QUANTITIES (MW) NORTH OF PATH 15

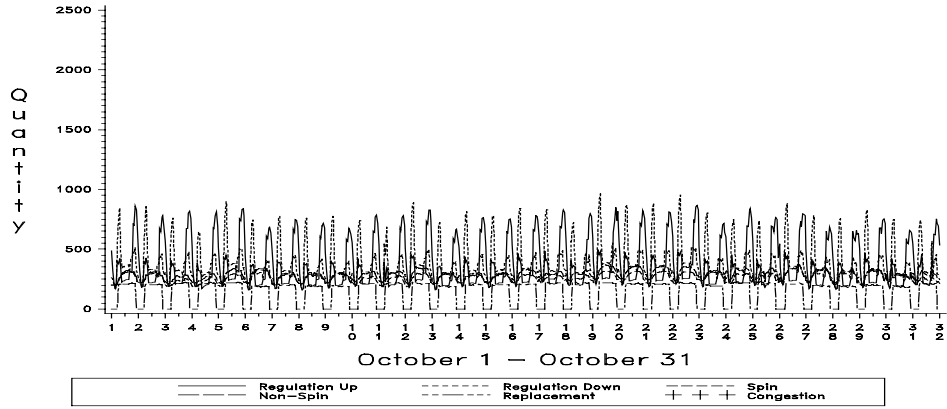


Figure 3 e

HOURLY ANCILLARY SERVICES QUANTITIES (MW) NORTH OF PATH 15

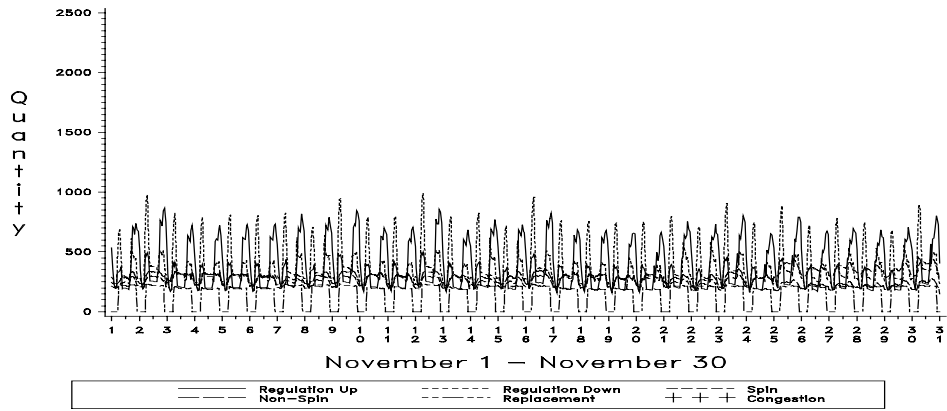


Figure 3 f

HOURLY ANCILLARY SERVICES QUANTITIES (MW) NORTH OF PATH 15

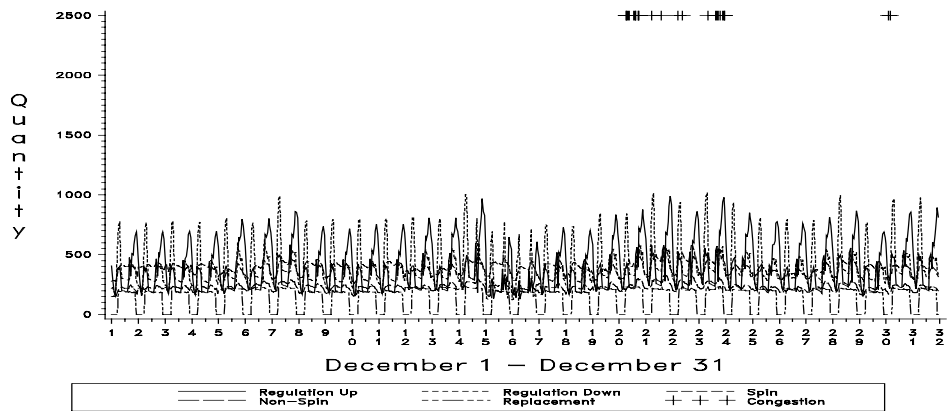


Figure 3 g

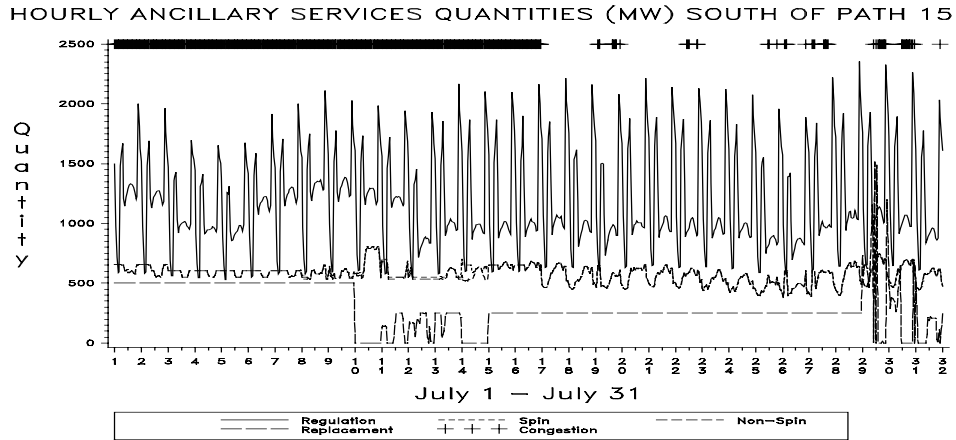


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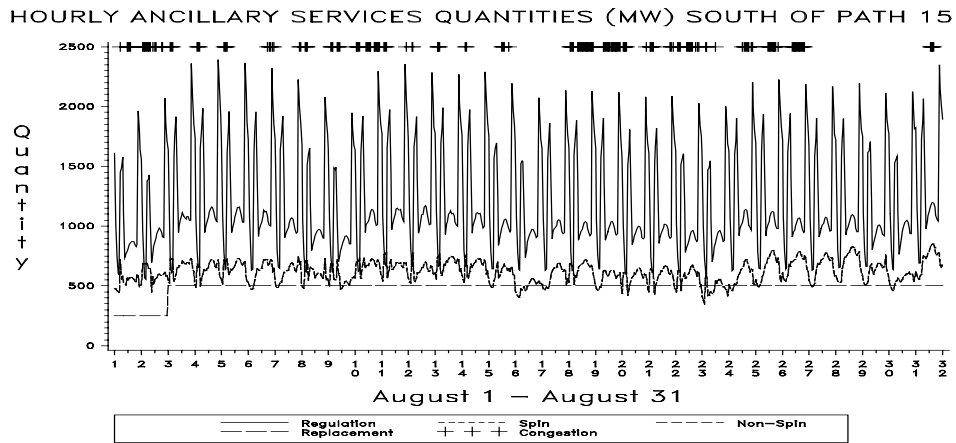


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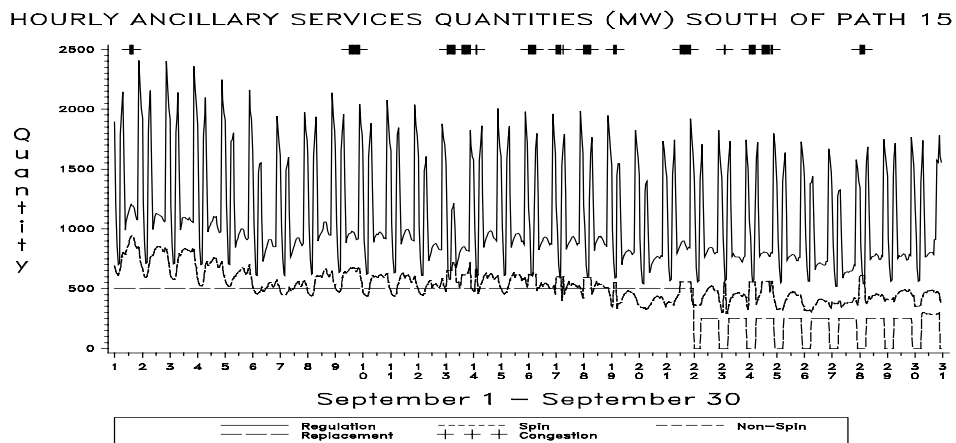


Figure 3 j

HOURLY ANCILLARY SERVICES QUANTITIES (MW) SOUTH OF PATH 15

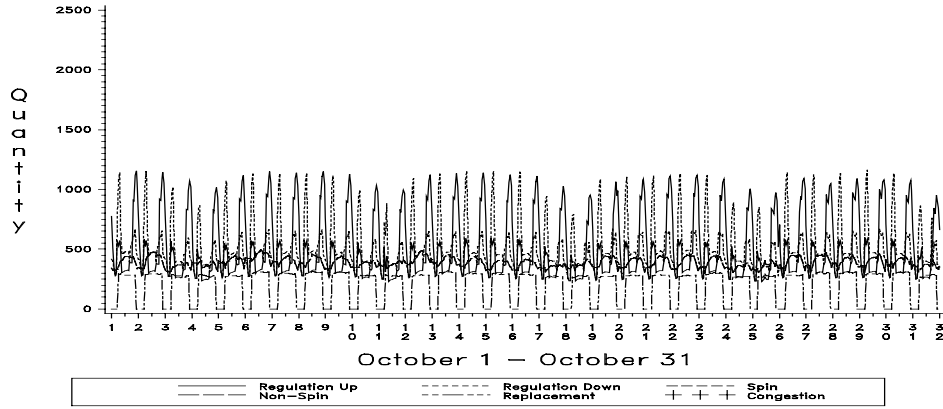


Figure 3 k

HOURLY ANCILLARY SERVICES QUANTITIES (MW) SOUTH OF PATH 15

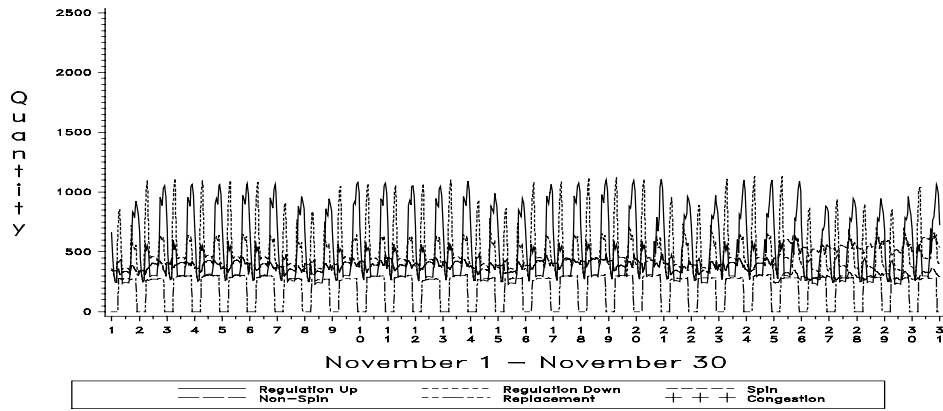


Figure 3 l

HOURLY ANCILLARY SERVICES QUANTITIES (MW) SOUTH OF PATH 15

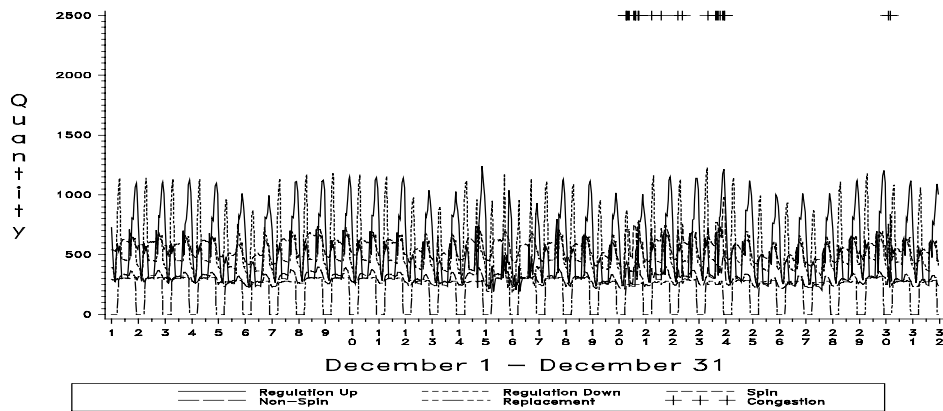


Figure 4 a

Hourly Bid Sufficiency Ancillary Services Markets
North of Path 15

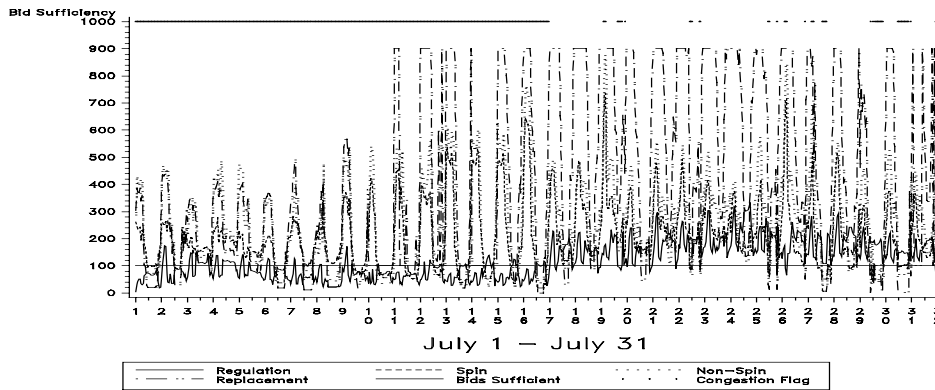


Figure 4 b

Hourly Bid Sufficiency Ancillary Services Markets
North of Path 15

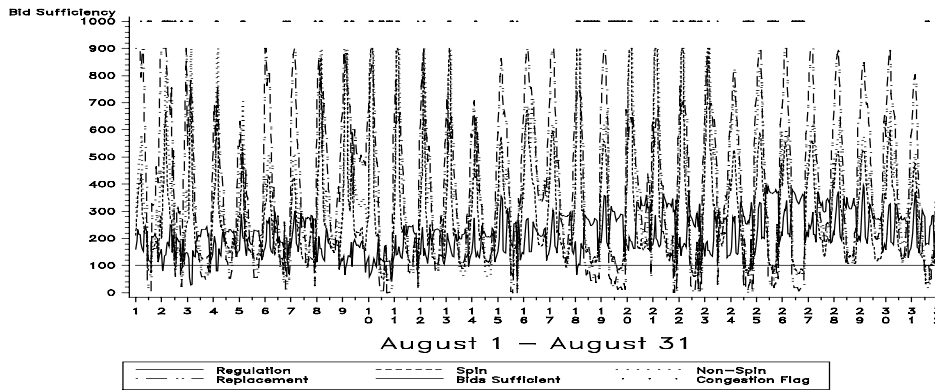


Figure 4 c

Hourly Bid Sufficiency Ancillary Services Markets
North of Path 15

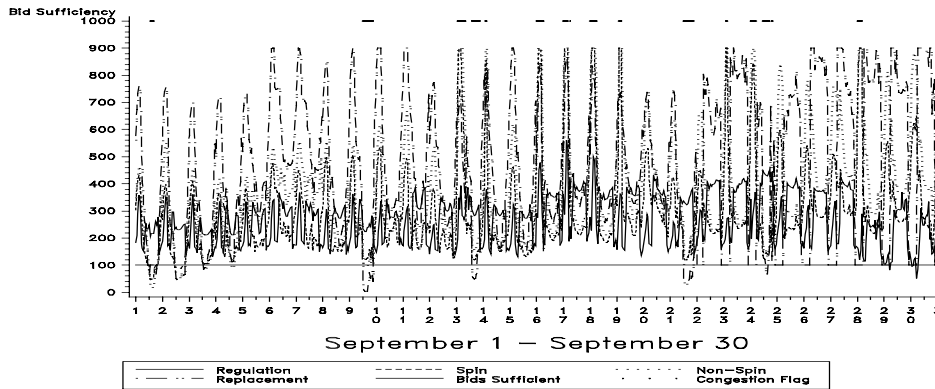


Figure 4 d

Hourly Bid Sufficiency Ancillary Services Markets
North of Path 15

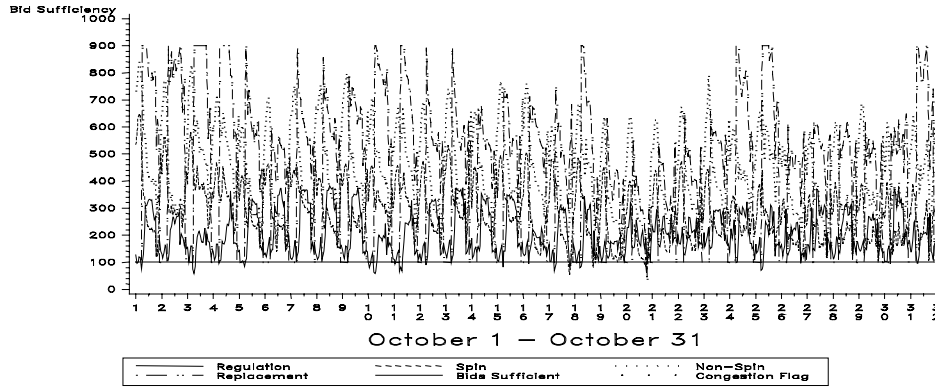


Figure 4 e

Hourly Bid Sufficiency Ancillary Services Markets
North of Path 15

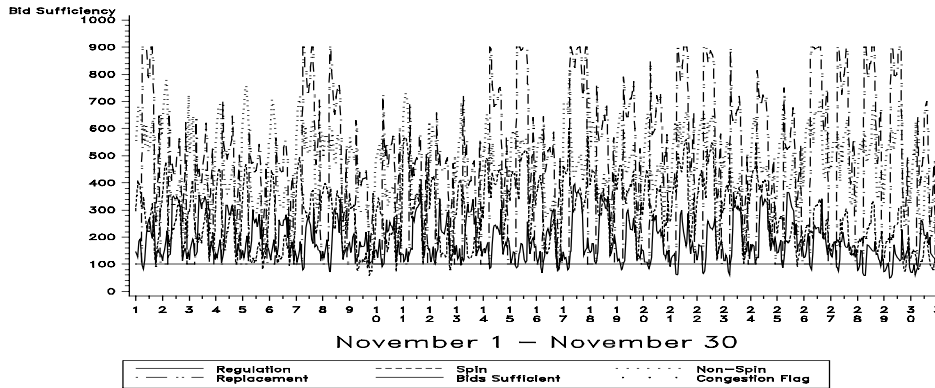


Figure 4 f

Hourly Bid Sufficiency Ancillary Services Markets
North of Path 15

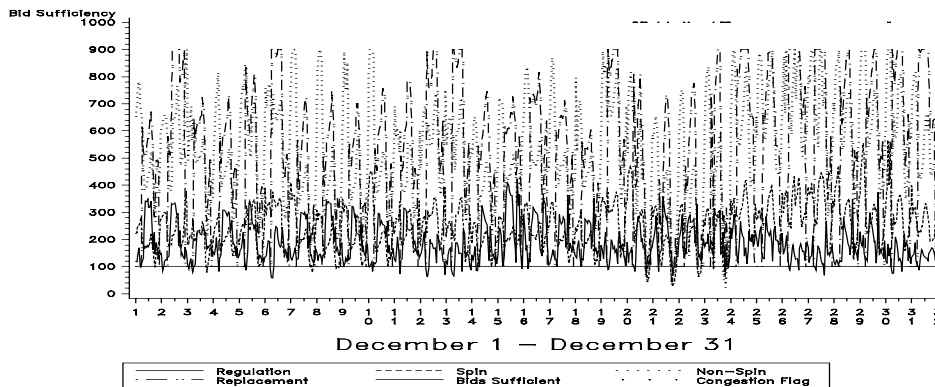


Figure 4 g

Hourly Bid Sufficiency Ancillary Services Markets
South of Path 15

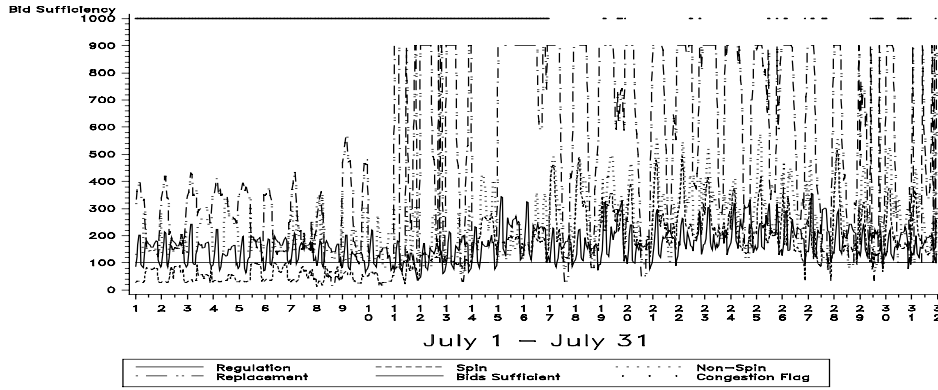


Figure 4 h

Hourly Bid Sufficiency Ancillary Services Markets
South of Path 15

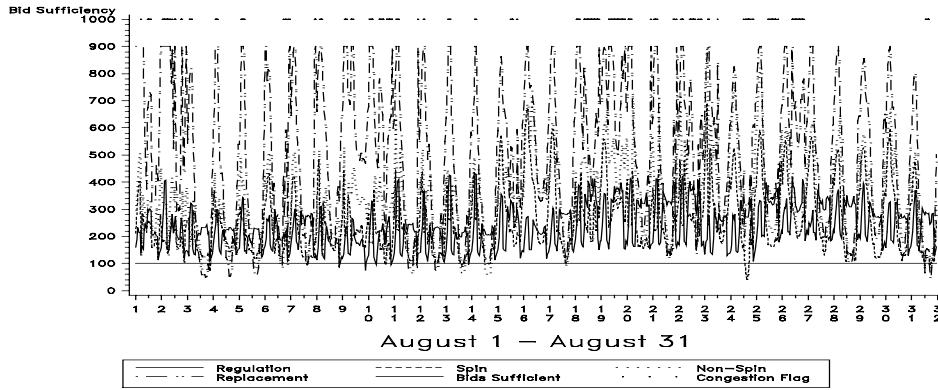


Figure 4 i

Hourly Bid Sufficiency Ancillary Services Markets
South of Path 15

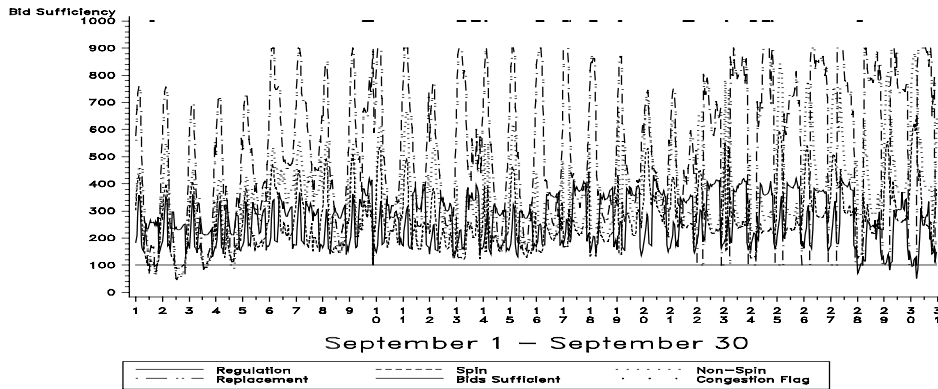


Figure 4 j

Hourly Bid Sufficiency Ancillary Services Markets
South of Path 15

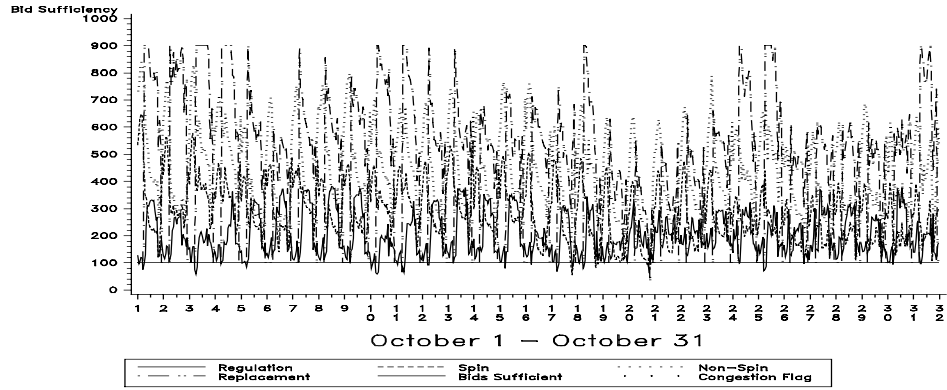


Figure 4 k

Hourly Bid Sufficiency Ancillary Services Markets
South of Path 15

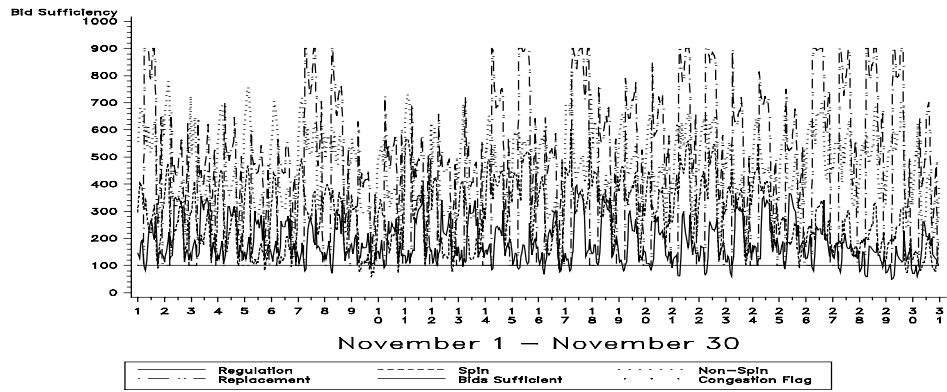


Figure 4 l

Hourly Bid Sufficiency Ancillary Services Markets
South of Path 15

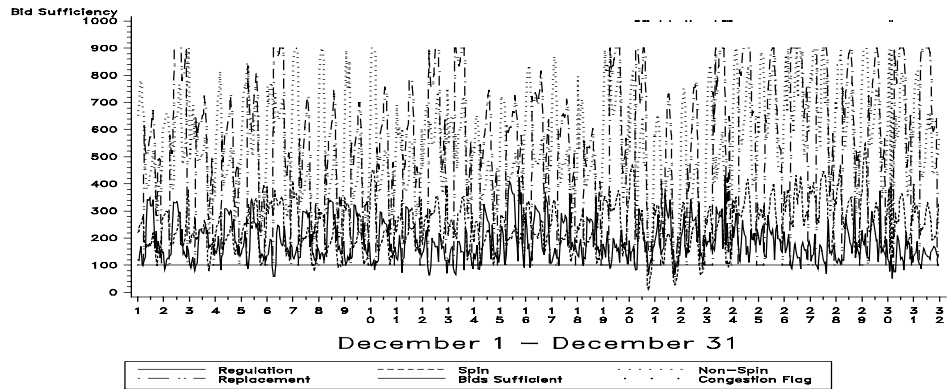


Figure 5 a

Percentage of Bid Insufficient Hours in Ancillary Services Markets
North of Path 15

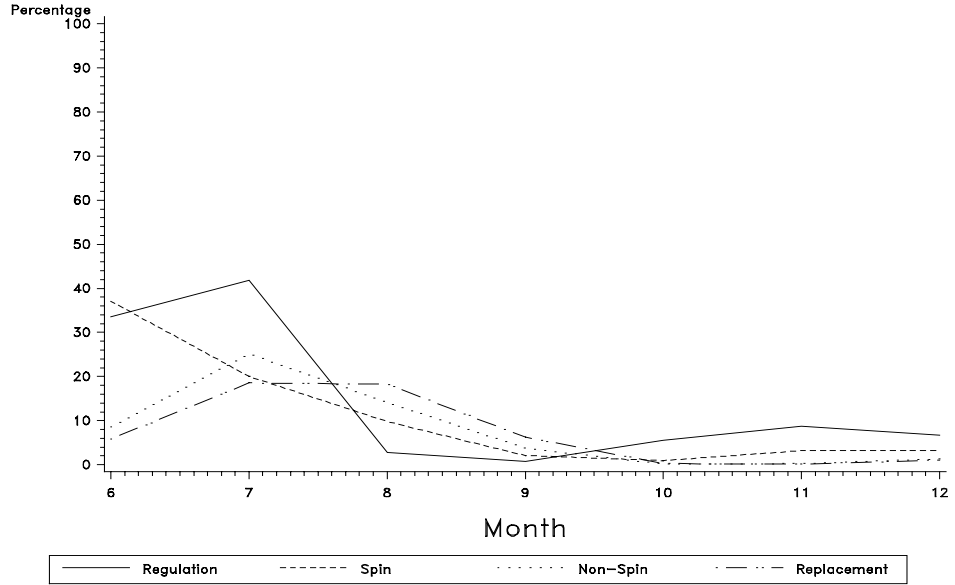


Figure 5 b

Percentage of Bid Insufficient Hours in Ancillary Services Markets
South of Path 15

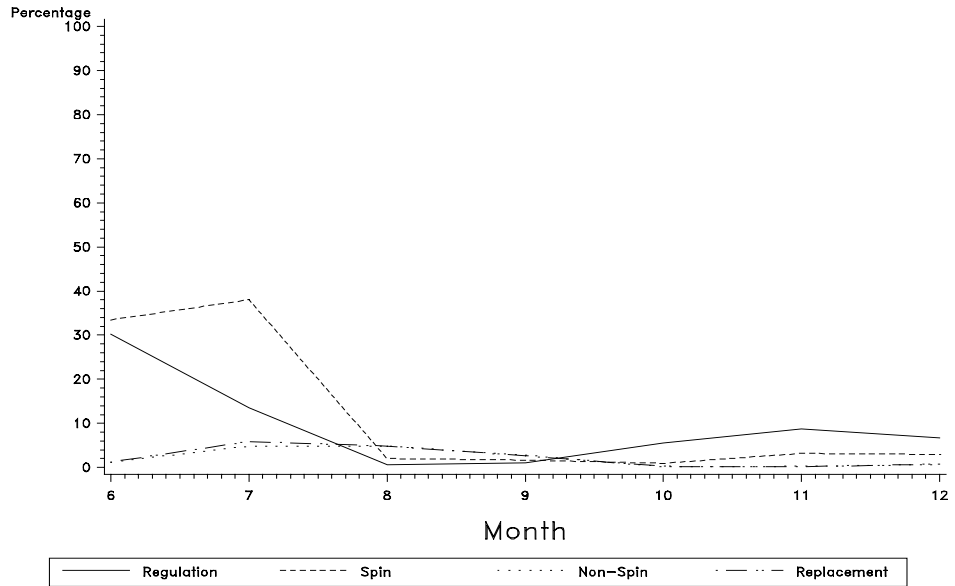


Figure 6 a

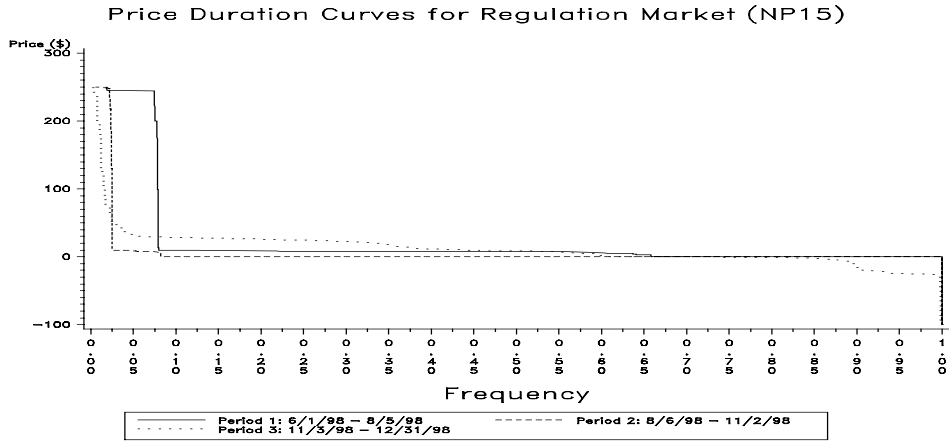


Figure 6 b

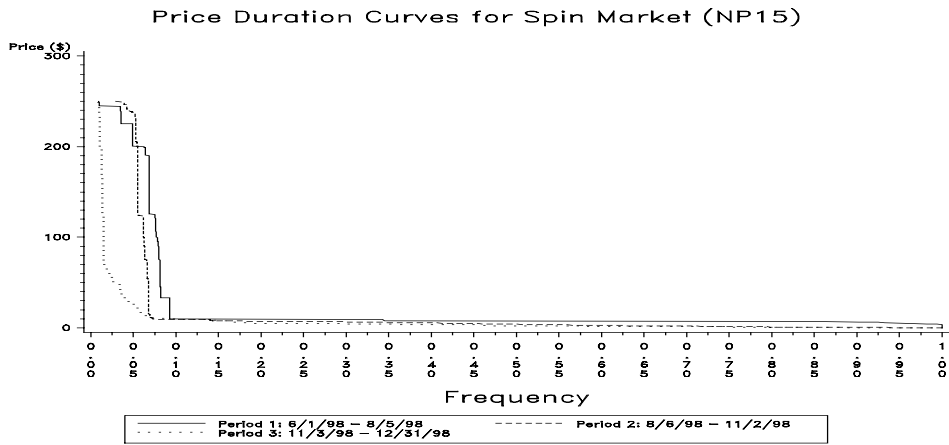


Figure 6 c

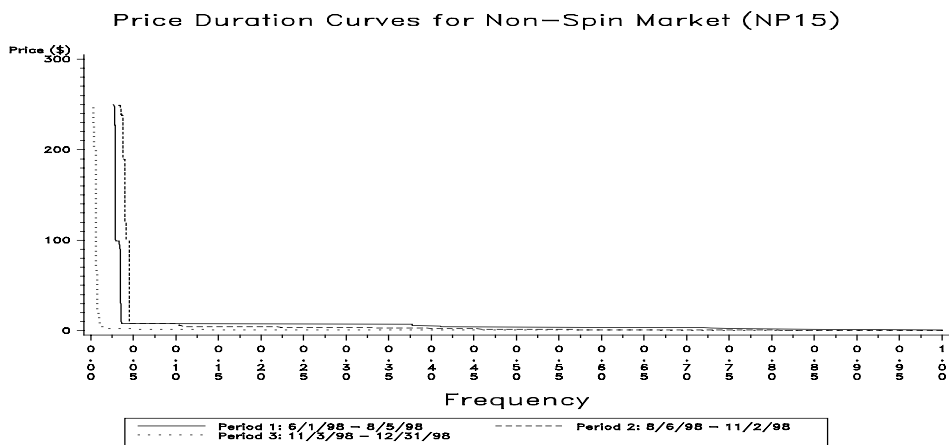


Figure 6 d

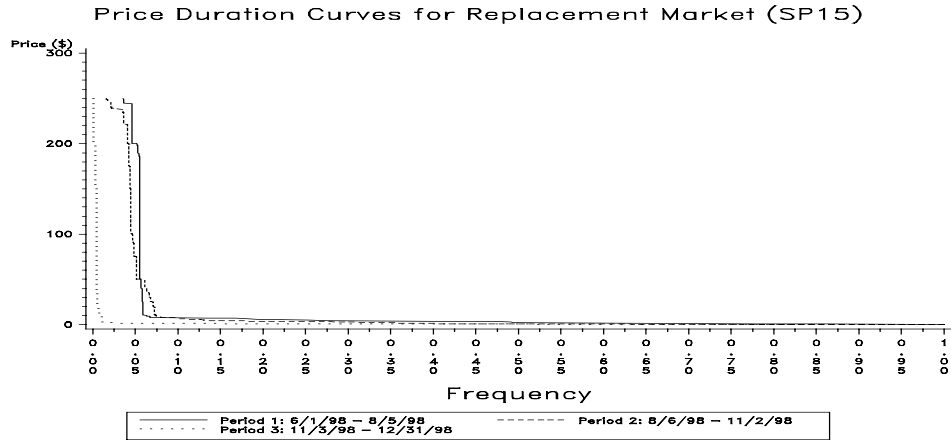


Figure 6 e

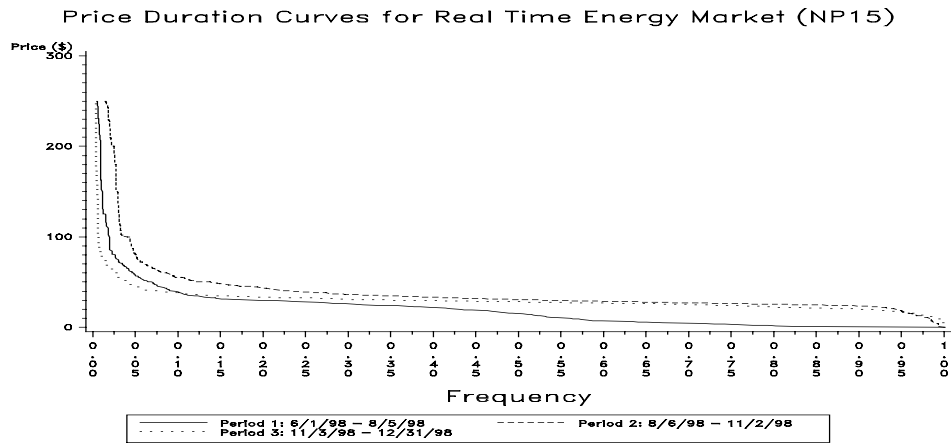


Figure 6 f

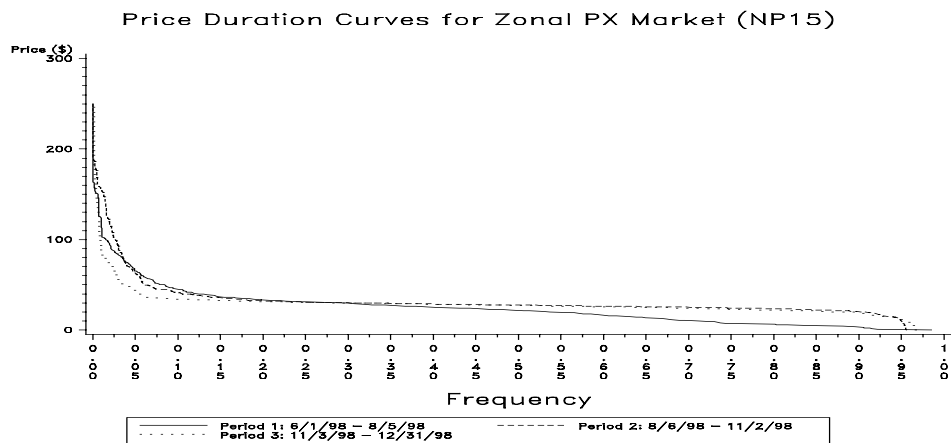


Figure 6 g

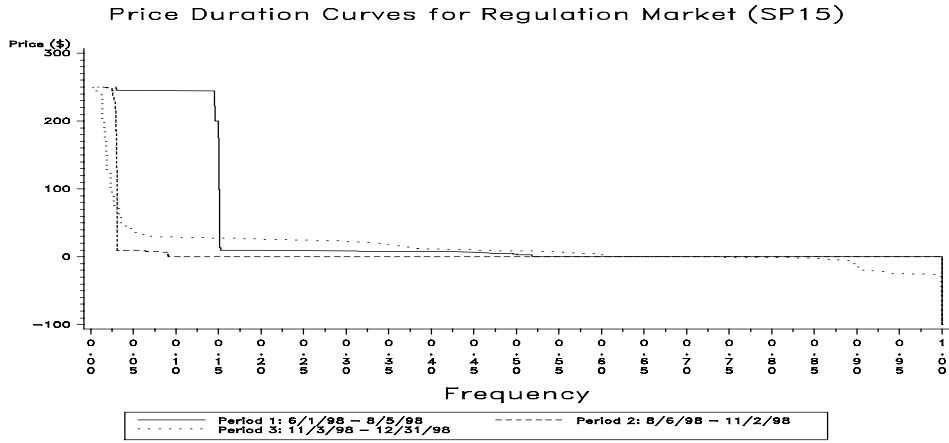


Figure 6 h

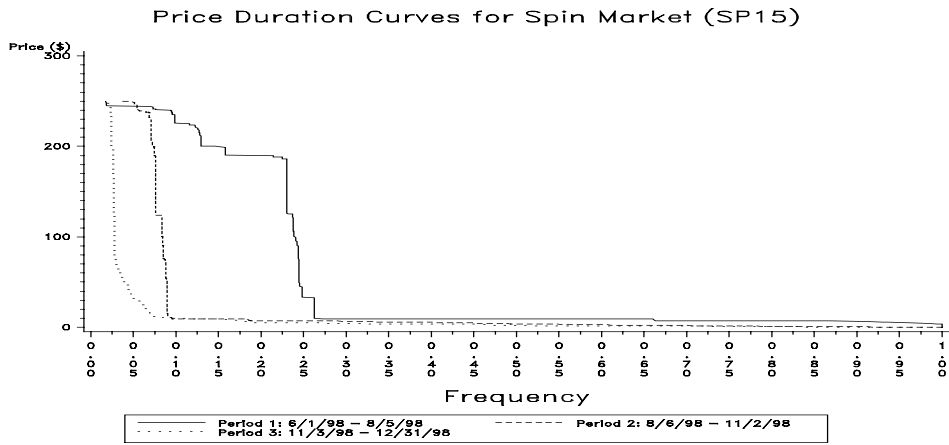


Figure 6 i

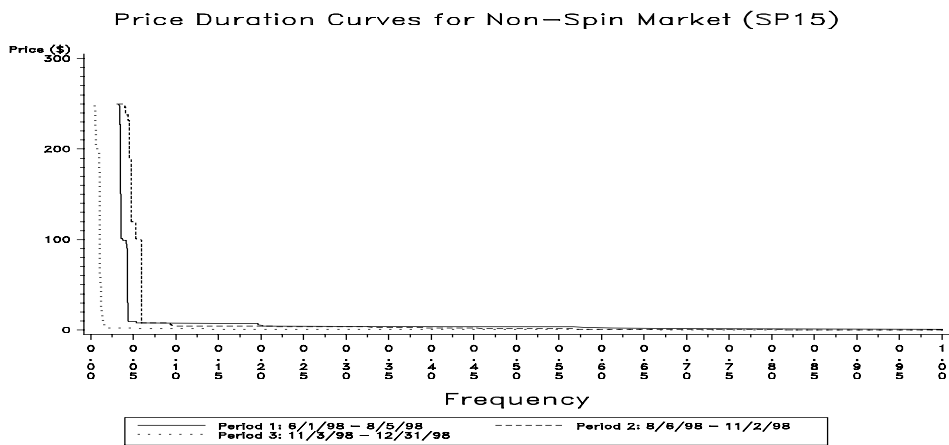


Figure 6 j

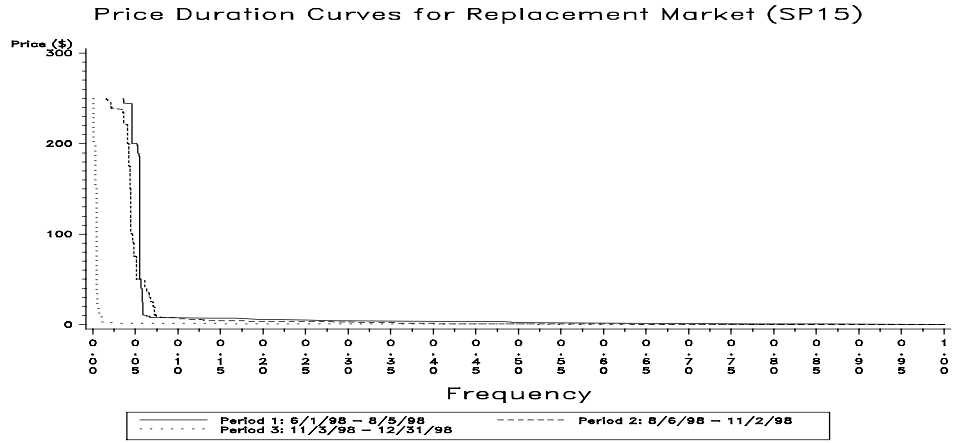


Figure 6 k

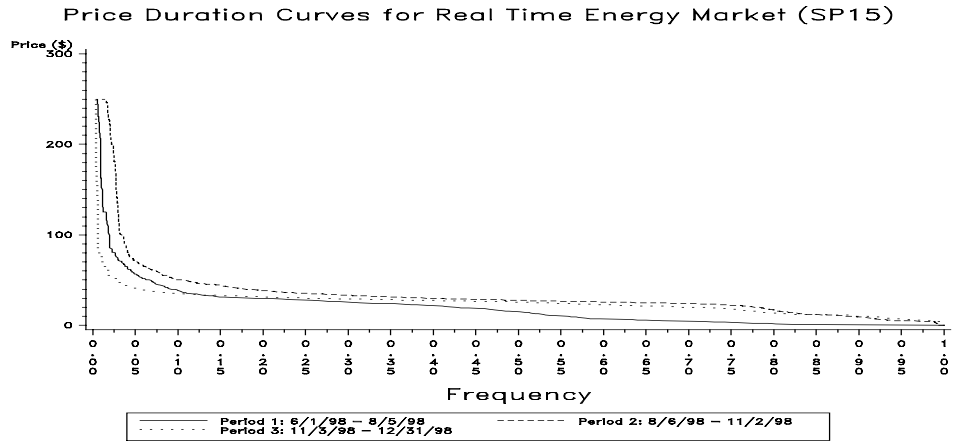


Figure 6 l

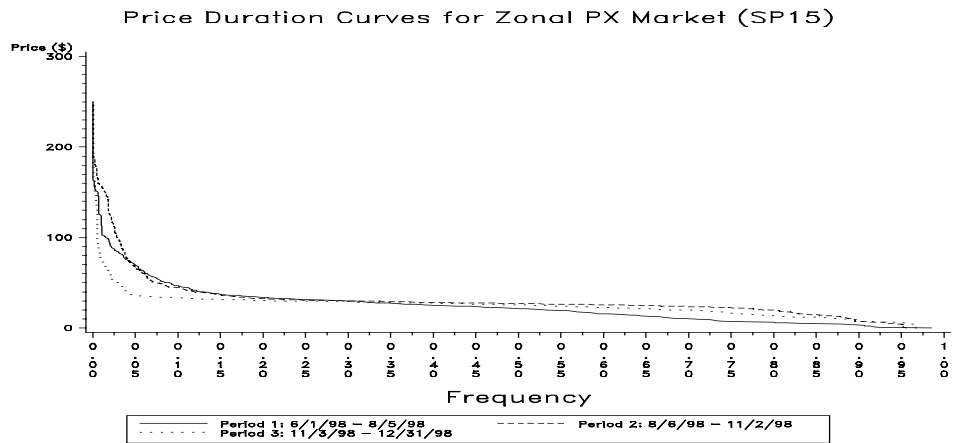


Figure 7 a

HOURLY POWER EXCHANGE PRICES (\$/MWH) AND QUANTITIES (MWH)

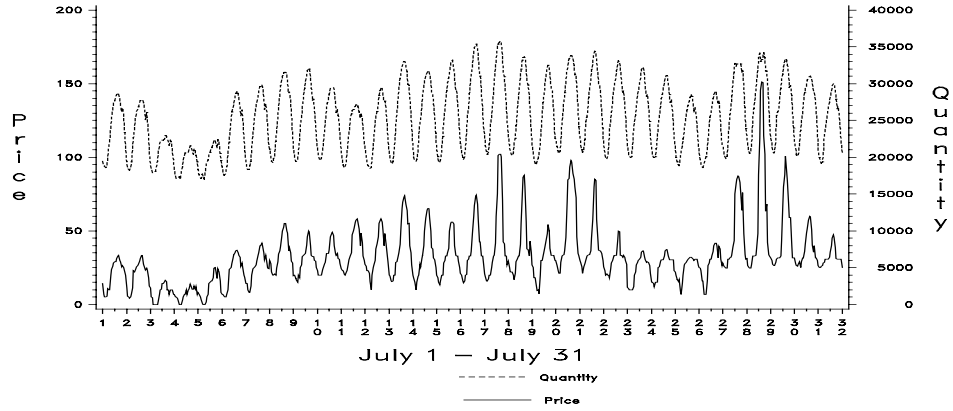


Figure 7 b

HOURLY POWER EXCHANGE PRICES (\$/MWH) AND QUANTITIES (MWH)

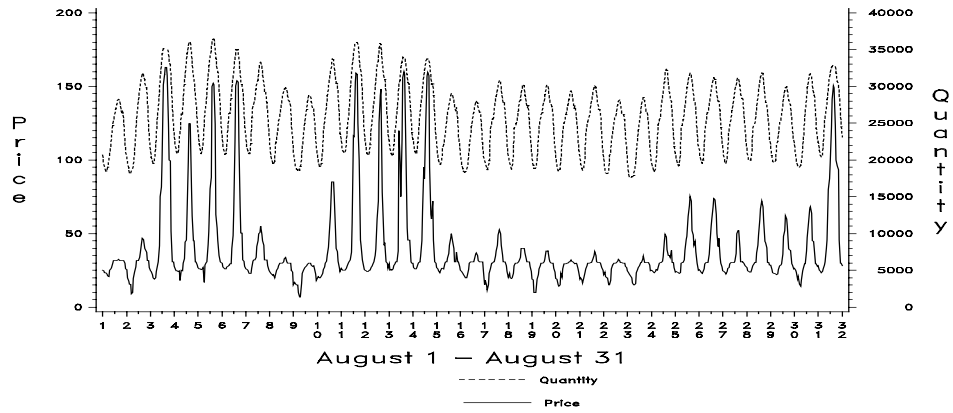


Figure 7 c

HOURLY POWER EXCHANGE PRICES (\$/MWH) AND QUANTITIES (MWH)

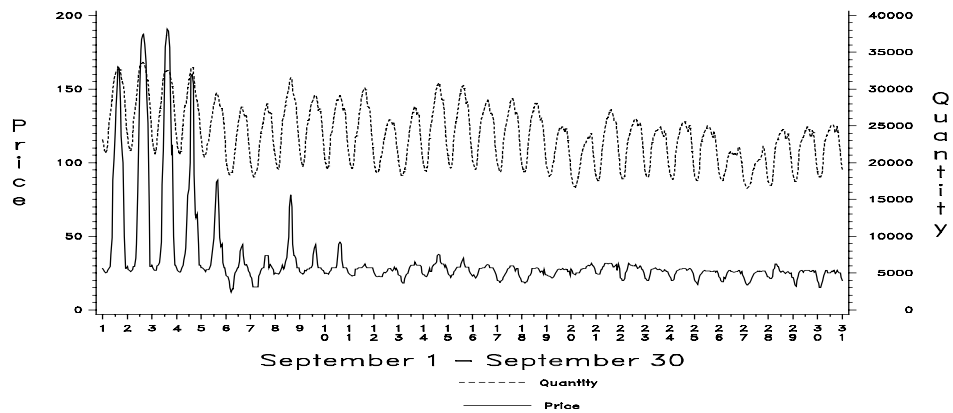


Figure 7 d

HOURLY POWER EXCHANGE PRICES (\$/MWH) AND QUANTITIES (MWH)

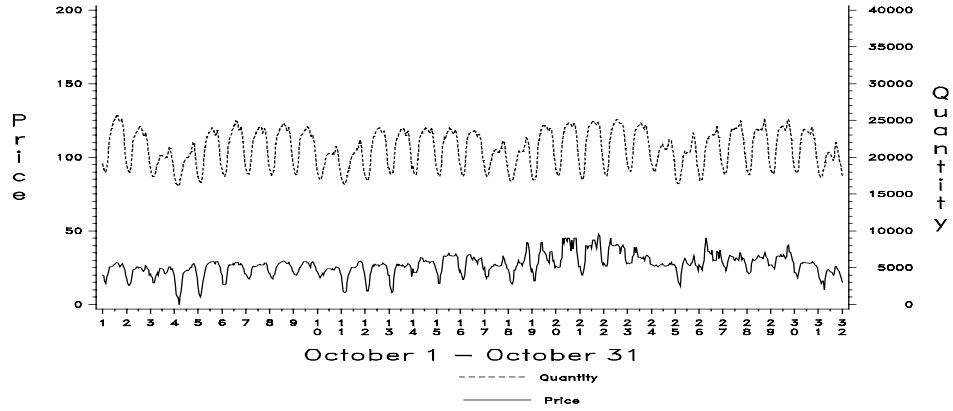


Figure 7 e

HOURLY POWER EXCHANGE PRICES (\$/MWH) AND QUANTITIES (MWH)

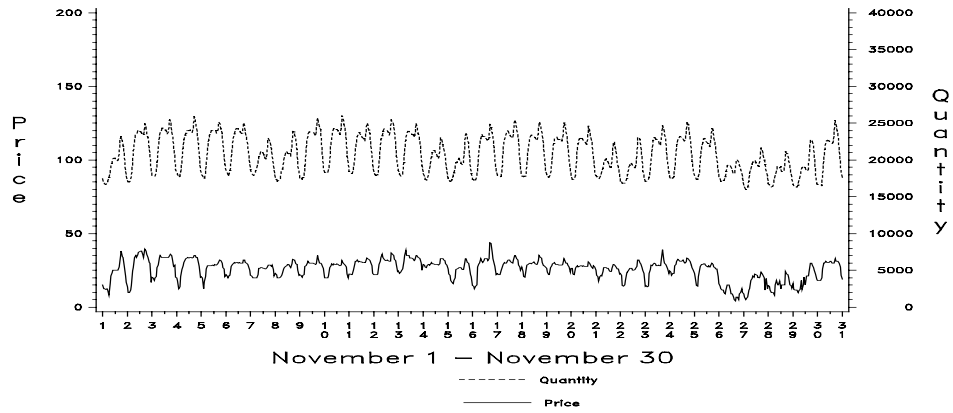


Figure 7 f

HOURLY POWER EXCHANGE PRICES (\$/MWH) AND QUANTITIES (MWH)

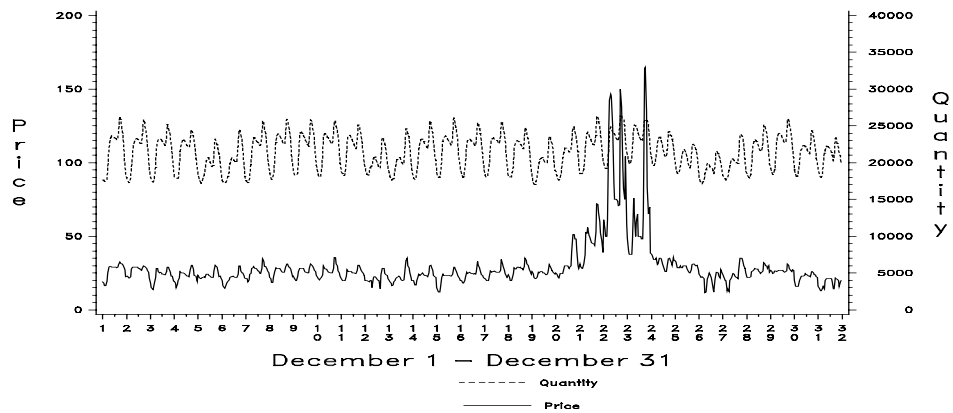


Figure 8 a

HOURLY REAL TIME PRICES (\$/MWH) AND IMBALANCE QUANTITIES (MWH)

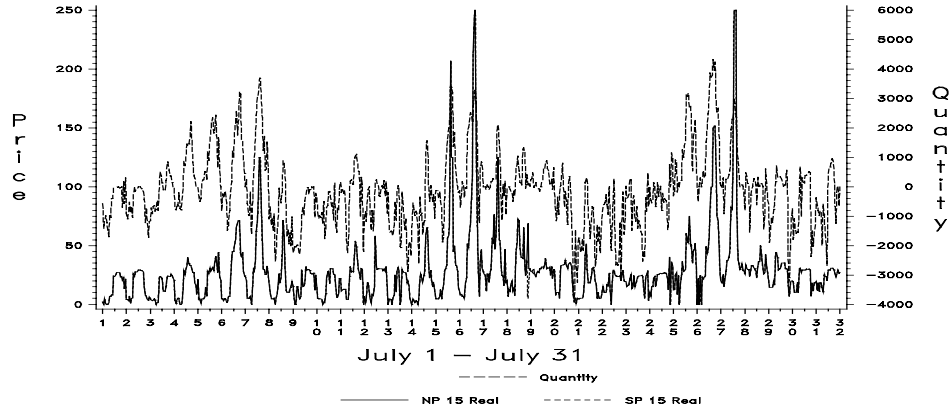


Figure 8 b

HOURLY REAL TIME PRICES (\$/MWH) AND IMBALANCE QUANTITIES (MWH)

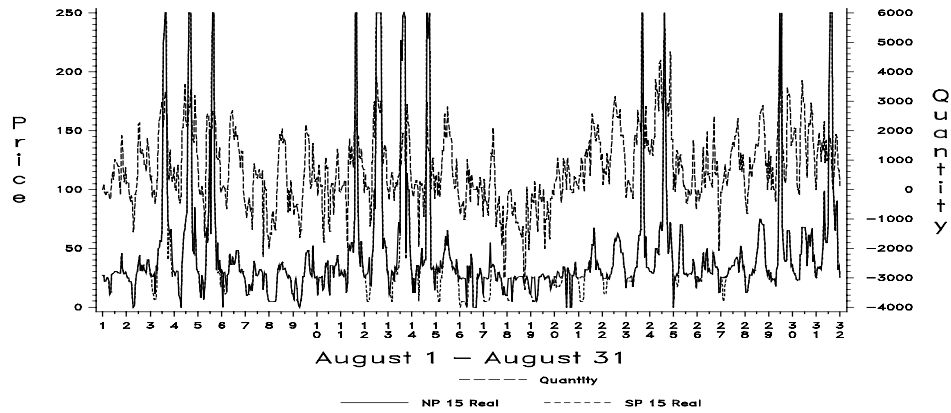


Figure 8 c

HOURLY REAL TIME PRICES (\$/MWH) AND IMBALANCE QUANTITIES (MWH)

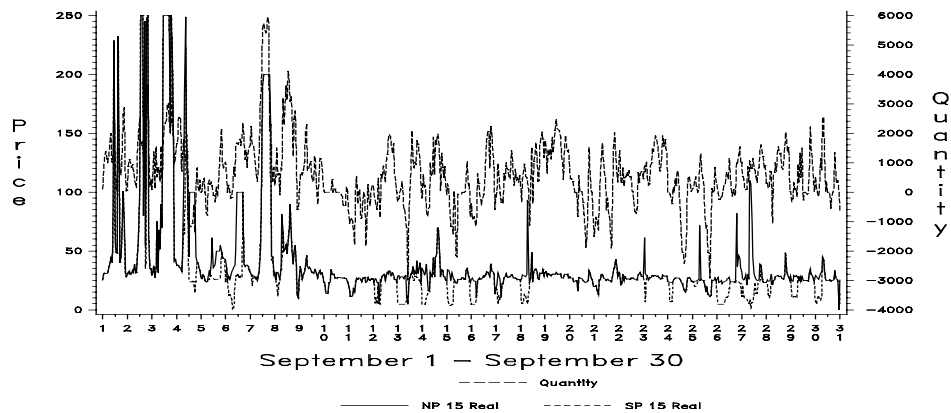


Figure 8 d

HOURLY REAL TIME PRICES (\$/MWH) AND IMBALANCE QUANTITIES (MWH)

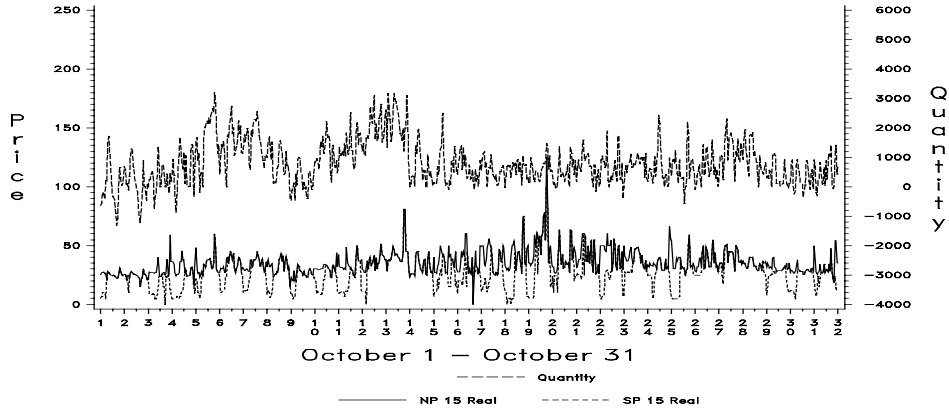


Figure 8 e

HOURLY REAL TIME PRICES (\$/MWH) AND IMBALANCE QUANTITIES (MWH)

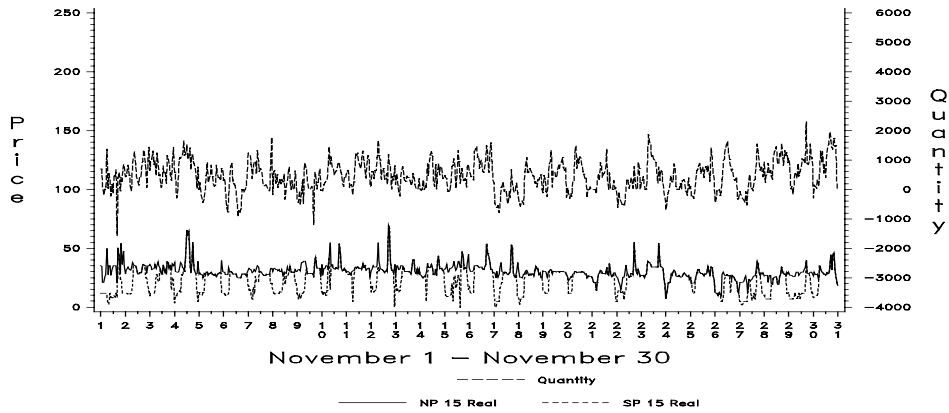


Figure 8 f

HOURLY REAL TIME PRICES (\$/MWH) AND IMBALANCE QUANTITIES (MWH)

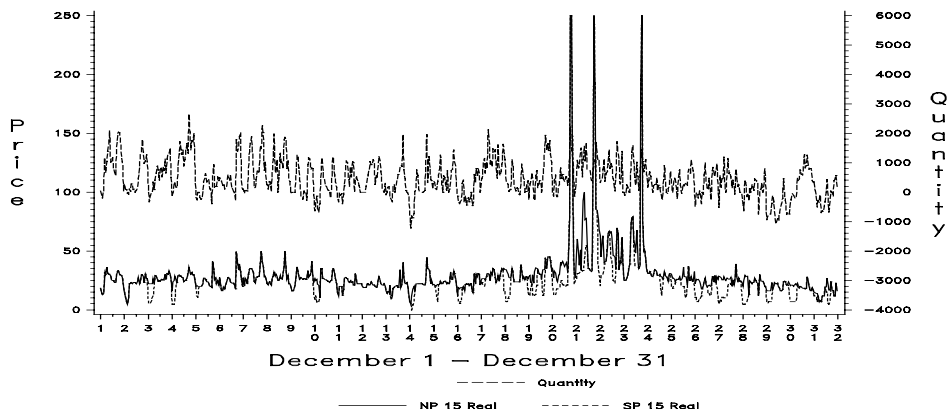


Figure 9 a

ISO Load Forecast and Power Exchange Market—Clearing Quantity

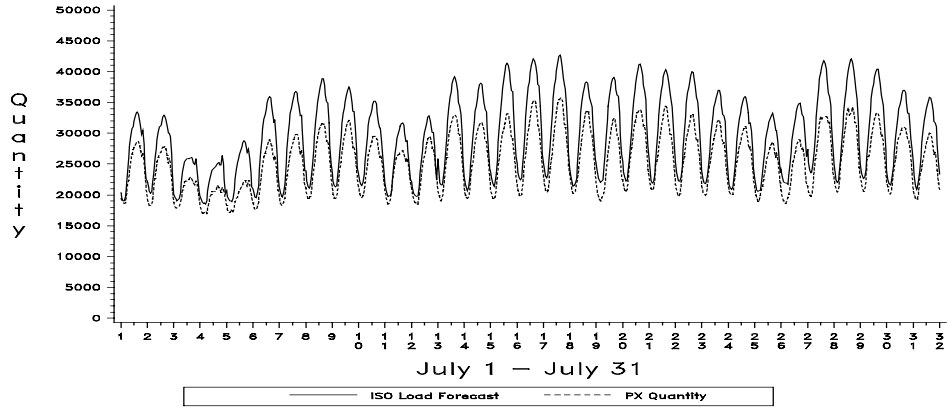


Figure 9 b

ISO Load Forecast and Power Exchange Market—Clearing Quantity

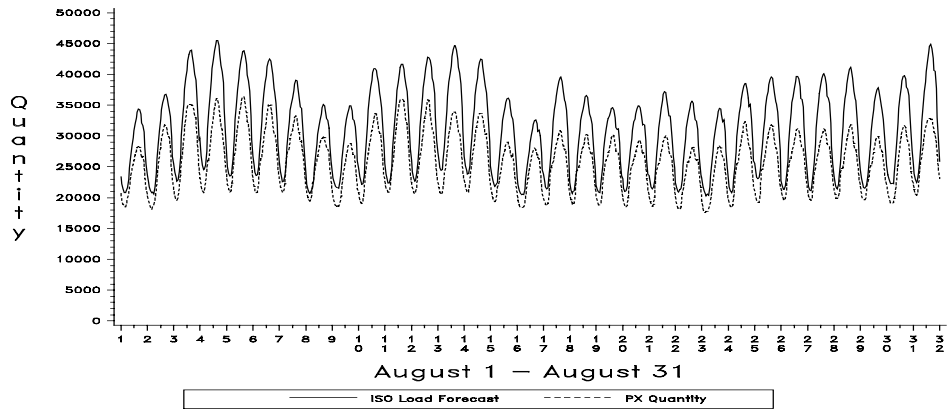


Figure 9 c

ISO Load Forecast and Power Exchange Market—Clearing Quantity

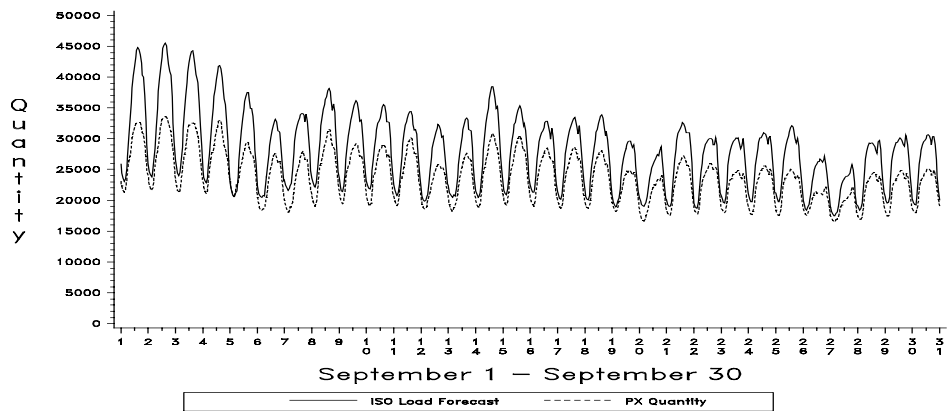


Figure 9 d

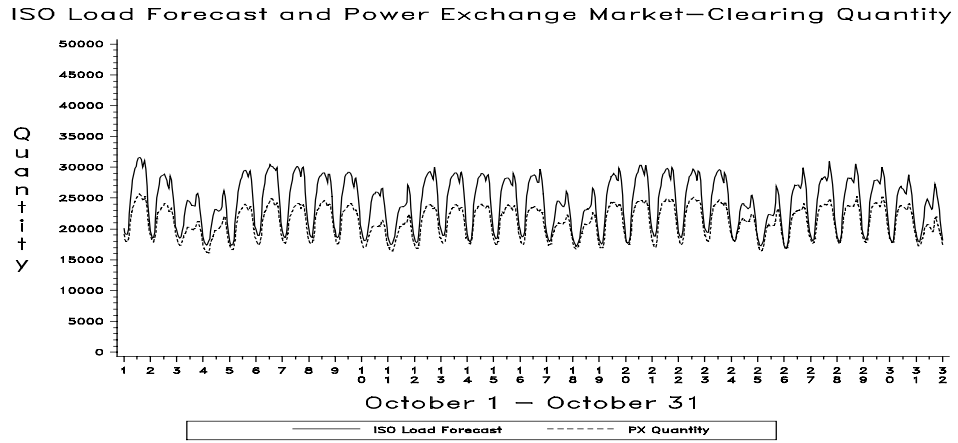


Figure 9 e

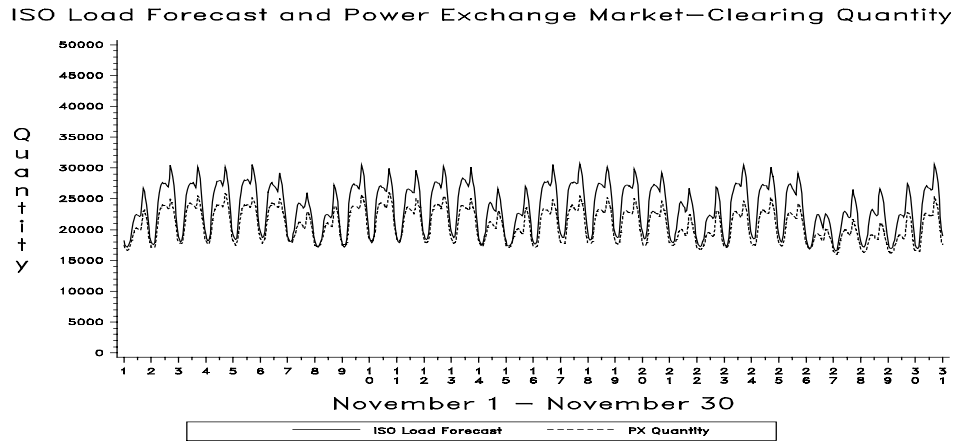


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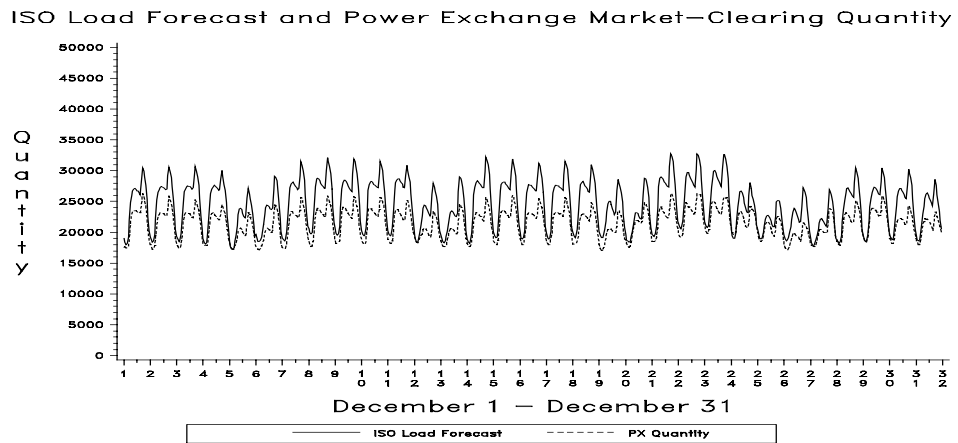


Figure 10 a

Total Hourly Quantity Bids (MW) By Investor-Owned Utilities
In Ancillary Service Markets

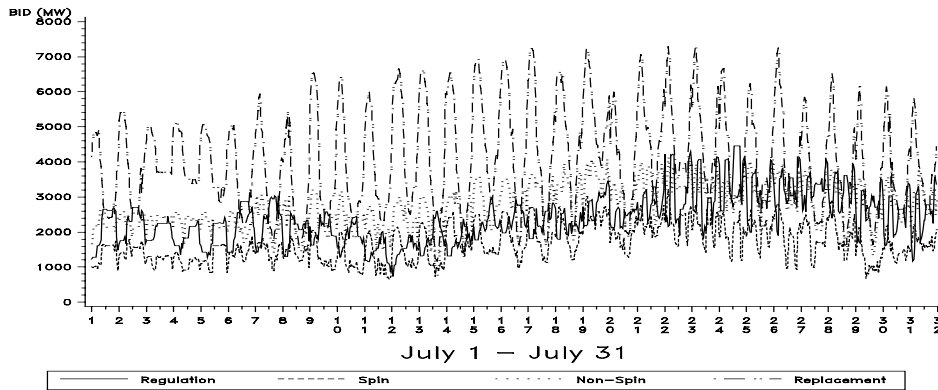


Figure 10 b

Total Hourly Quantity Bids (MW) By Investor-Owned Utilities
In Ancillary Service Markets

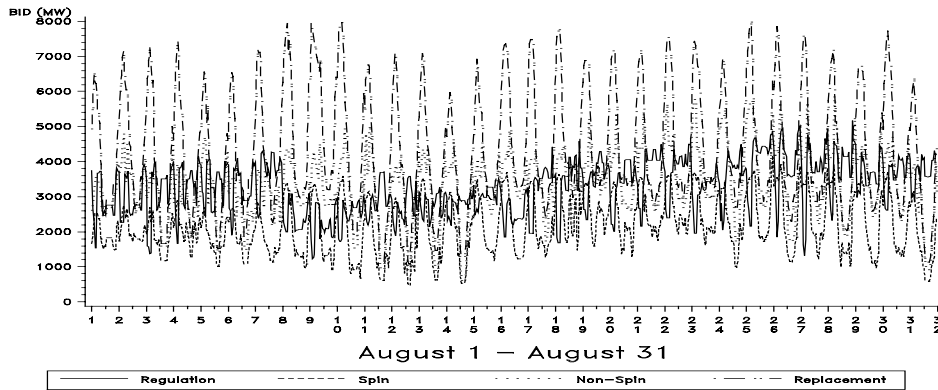


Figure 10 c

Total Hourly Quantity Bids (MW) By Investor-Owned Utilities
In Ancillary Service Markets

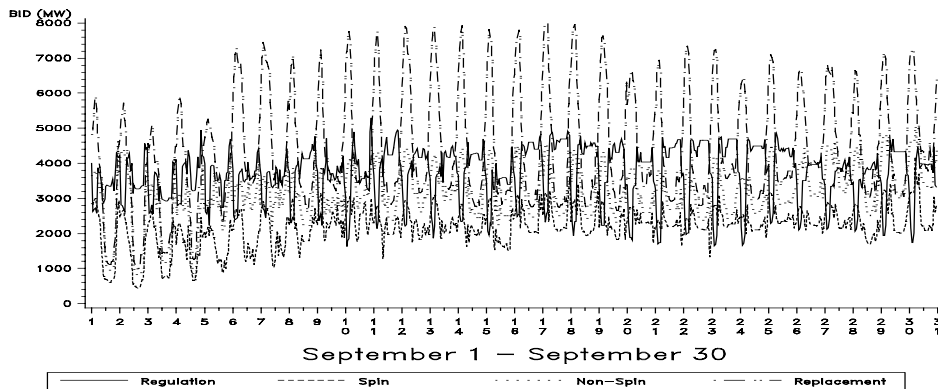


Figure 10 d

Total Hourly Quantity Bids (MW) By Investor-Owned Utilities
In Ancillary Service Markets

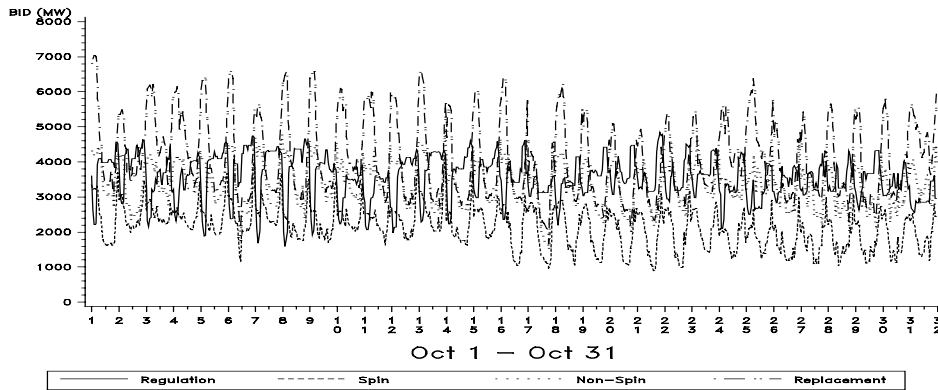


Figure 10 e

Total Hourly Quantity Bids (MW) By Investor-Owned Utilities
In Ancillary Service Markets

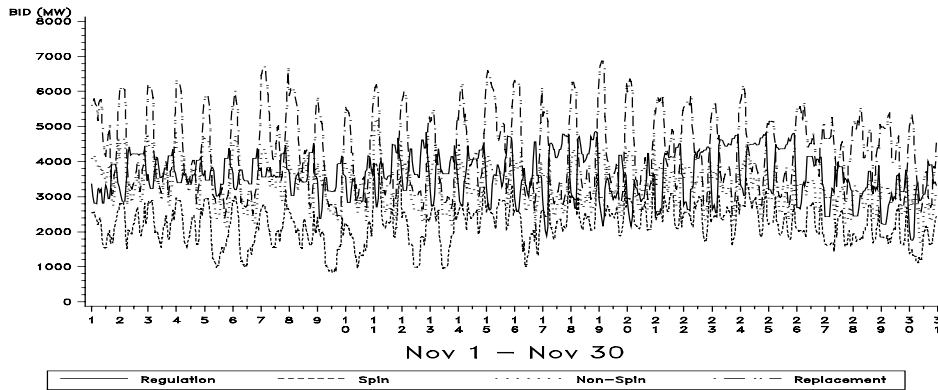


Figure 10 f

Total Hourly Quantity Bids (MW) By Investor-Owned Utilities
In Ancillary Service Markets

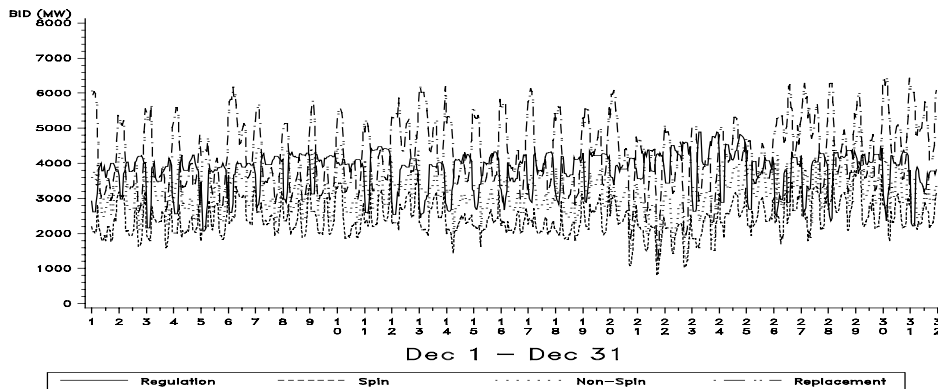


Figure 10 g

Total Hourly Quantity Bids (MW) By New Generator Owners
In Ancillary Service Markets

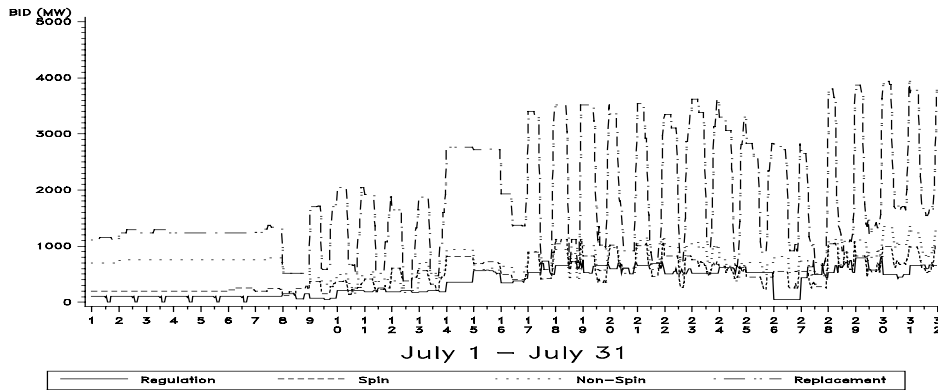


Figure 10 h

Total Hourly Quantity Bids (MW) By New Generator Owners
In Ancillary Service Markets

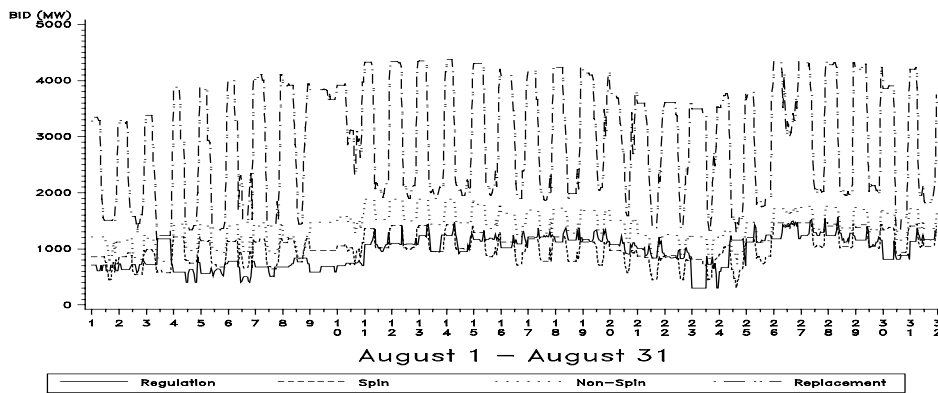


Figure 10 i

Total Hourly Quantity Bids (MW) By New Generator Owners
In Ancillary Service Markets

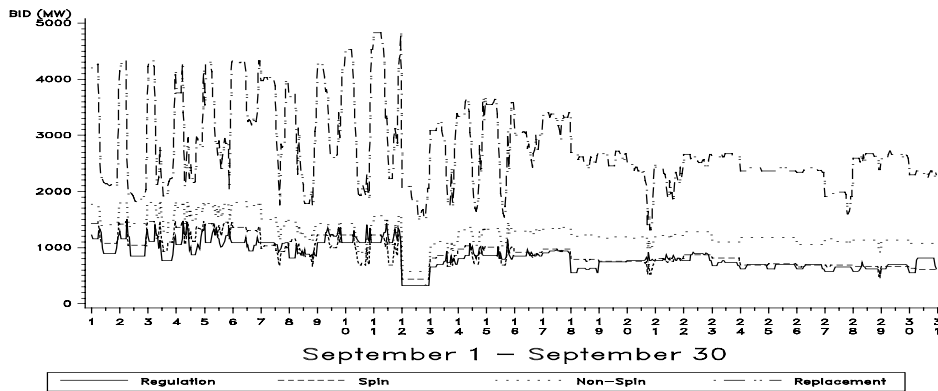


Figure 10 j

Total Hourly Quantity Bids (MW) By New Generator Owners
In Ancillary Service Markets

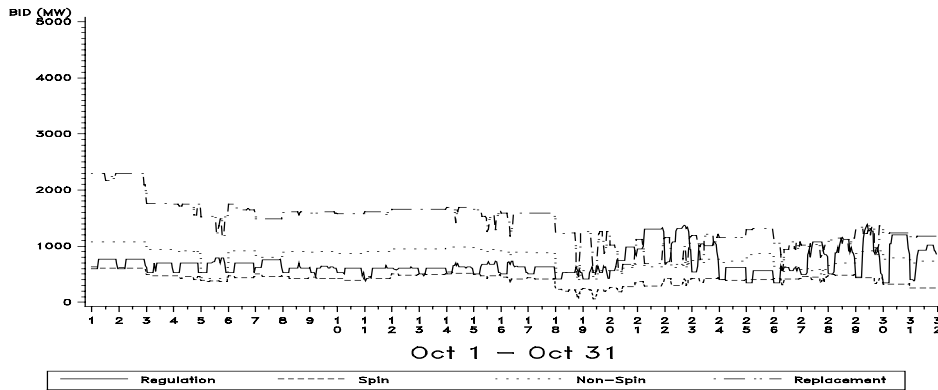


Figure 10 k

Total Hourly Quantity Bids (MW) By New Generator Owners
In Ancillary Service Markets

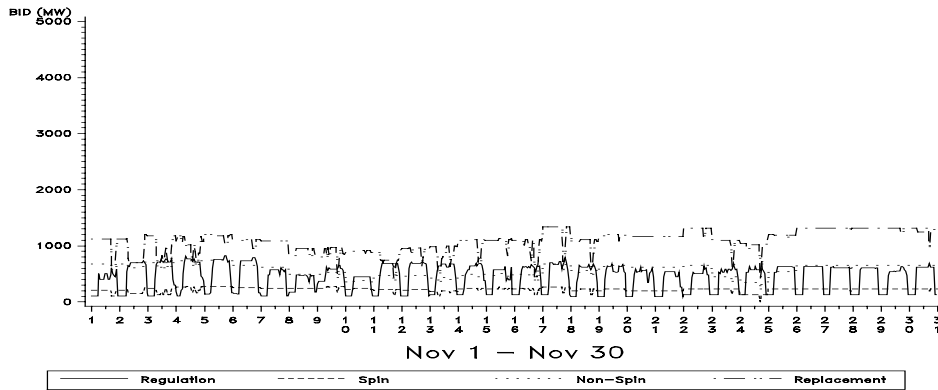


Figure 10 l

Total Hourly Quantity Bids (MW) By New Generator Owners
In Ancillary Service Markets

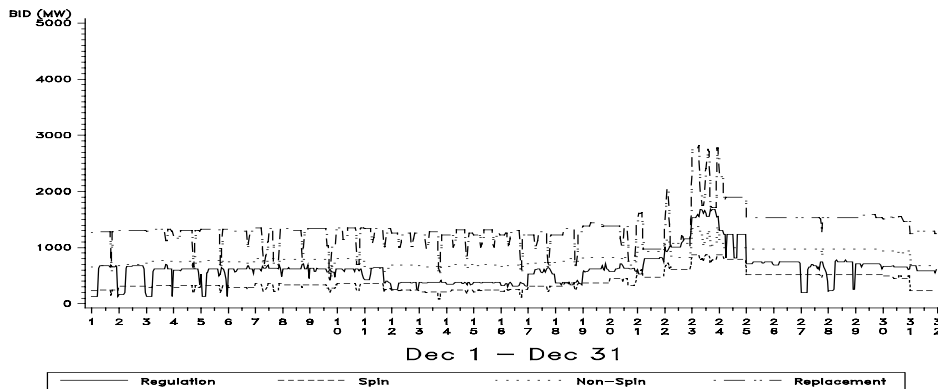


Figure 11 a

Percentage of Pivotal Hours in Ancillary Services Markets
Firm 1 : Full Market

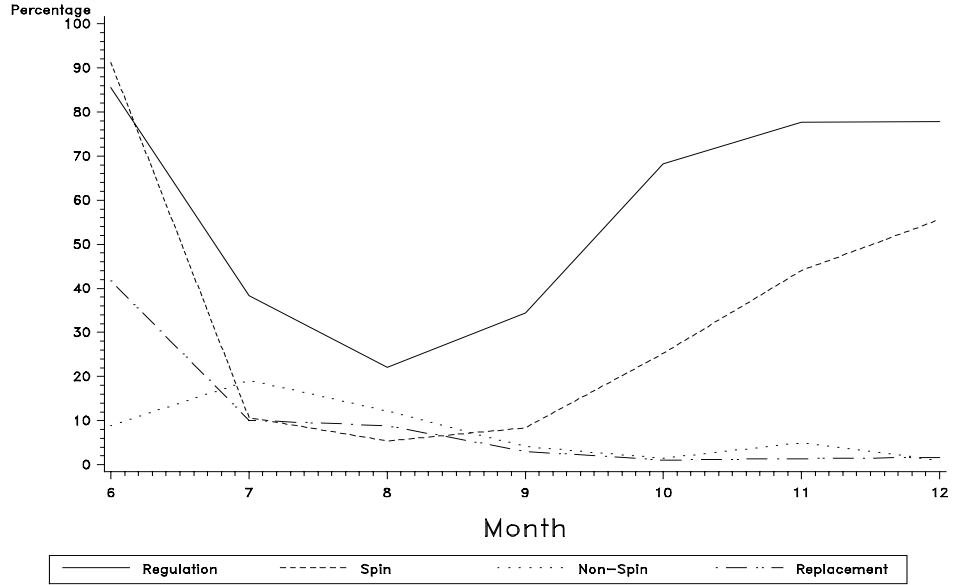


Figure 11 b

Percentage of Pivotal Hours in Ancillary Services Markets
Firm 2 : Full Market

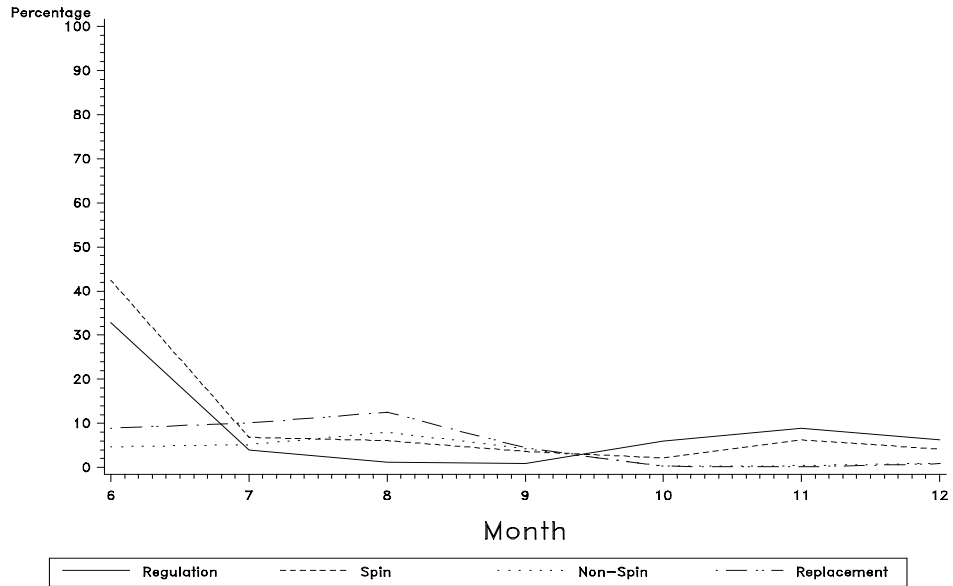


Table 1a : Ancillary Services Prices in \$ per MW for NP15

| | | NP15 | | | | | |
|-----------|---------|------------|---------|----------|-------------|-----------|---------|
| | | Regulation | Spin | Non-Spin | Replacement | Real-time | PX |
| June | Mean | \$33.65 | \$33.15 | \$3.21 | \$3.82 | \$8.38 | \$12.09 |
| | Std Dev | \$78.35 | \$70.20 | \$2.11 | \$2.17 | \$10.94 | \$9.36 |
| July | Mean | \$15.26 | \$15.32 | \$16.38 | \$15.22 | \$27.73 | \$32.41 |
| | Std Dev | \$47.39 | \$38.10 | \$46.48 | \$47.83 | \$29.72 | \$20.71 |
| August | Mean | \$12.83 | \$35.71 | \$28.50 | \$34.68 | \$45.40 | \$39.53 |
| | Std Dev | \$51.53 | \$74.94 | \$71.97 | \$78.91 | \$49.57 | \$29.10 |
| September | Mean | \$0.40 | \$19.67 | \$14.31 | \$11.64 | \$40.77 | \$34.01 |
| | Std Dev | \$9.28 | \$57.58 | \$51.71 | \$42.54 | \$41.76 | \$27.93 |
| October | Mean | \$7.41 | \$2.60 | \$0.63 | \$0.39 | \$35.30 | \$26.65 |
| | Std Dev | \$41.45 | \$12.93 | \$0.29 | \$0.63 | \$10.45 | \$7.08 |
| November | Mean | -\$1.43 | \$3.32 | \$0.86 | \$0.54 | \$30.58 | \$25.74 |
| | Std Dev | \$18.99 | \$11.65 | \$0.99 | \$1.12 | \$6.67 | \$6.93 |
| December | Mean | \$23.71 | \$11.92 | \$3.22 | \$2.10 | \$29.59 | \$29.13 |
| | Std Dev | \$32.43 | \$36.28 | \$23.18 | \$15.85 | \$22.37 | \$17.36 |

Table 1b : Ancillary Services Prices in \$ per MW for SP15

| | | SP15 | | | | | |
|-----------|---------|------------|---------|----------|-------------|-----------|---------|
| | | Regulation | Spin | Non-Spin | Replacement | Real-time | PX |
| June | Mean | \$34.29 | \$39.59 | \$3.05 | \$3.65 | \$8.38 | \$12.09 |
| | Std Dev | \$79.12 | \$77.68 | \$2.11 | \$2.19 | \$10.94 | \$9.36 |
| July | Mean | \$48.45 | \$76.95 | \$14.78 | \$22.63 | \$27.62 | \$32.41 |
| | Std Dev | \$95.15 | \$96.04 | \$47.55 | \$66.20 | \$29.69 | \$20.71 |
| August | Mean | \$16.84 | \$50.23 | \$37.08 | \$35.04 | \$43.53 | \$39.53 |
| | Std Dev | \$59.15 | \$88.61 | \$81.01 | \$79.36 | \$50.43 | \$29.10 |
| September | Mean | \$0.77 | \$23.50 | \$15.64 | \$11.87 | \$35.13 | \$34.01 |
| | Std Dev | \$13.15 | \$64.08 | \$54.60 | \$42.82 | \$41.22 | \$27.93 |
| October | Mean | \$7.41 | \$2.60 | \$0.63 | \$0.39 | \$27.69 | \$26.65 |
| | Std Dev | \$41.45 | \$12.93 | \$0.29 | \$0.63 | \$13.87 | \$7.08 |
| November | Mean | -\$1.43 | \$3.32 | \$0.86 | \$0.54 | \$24.08 | \$25.74 |
| | Std Dev | \$18.99 | \$11.65 | \$0.99 | \$1.12 | \$10.89 | \$6.93 |
| December | Mean | \$27.32 | \$17.87 | \$5.01 | \$2.10 | \$26.13 | \$29.13 |
| | Std Dev | \$40.10 | \$52.03 | \$30.79 | \$15.85 | \$22.40 | \$17.36 |

Table 2a : Ancillary Services Bid Price Inequalities

| Violation of Bid Inequality | Group | IOU | | | NGO | | |
|--|-----------|---------|---------|---------|---------|---------|---------|
| | Period | 1 | 2 | 3 | 1 | 2 | 3 |
| $P_{reg} \geq P_{spin} \geq P_{nspin} \geq P_{repl}$ | Frequency | 0.74414 | 0.91383 | 0.724 | 0.29312 | 0.3289 | 0.30096 |
| $P_{spin} \geq P_{nspin} \geq P_{repl}$ | Frequency | 0.37618 | 0.40402 | 0.47533 | 0.27669 | 0.30383 | 0.29066 |
| $P_{spin} \geq P_{nspin}$ | Frequency | 0.32585 | 0.16238 | 0.36077 | 0.1071 | 0.11623 | 0.10409 |
| $P_{nspin} \geq P_{repl}$ | Frequency | 0.04875 | 0.22414 | 0.11484 | 0.23992 | 0.22488 | 0.23451 |

Table 2b : Ancillary Services Bid Quantity Inequalities

| Violation of Bid Inequality | Group | IOU | | | NGO | | |
|--|-----------|---------|---------|---------|---------|---------|---------|
| | Period | 1 | 2 | 3 | 1 | 2 | 3 |
| $Q_{reg} \leq Q_{spin} \leq Q_{nspin} \leq Q_{repl}$ | Frequency | 0.2129 | 0.24342 | 0.2817 | 0.26422 | 0.21226 | 0.09379 |
| $Q_{spin} \leq Q_{nspin} \leq Q_{repl}$ | Frequency | 0.00431 | 0.0043 | 0.01965 | 0.15934 | 0.06215 | 0.0228 |
| $Q_{spin} \leq Q_{nspin}$ | Frequency | 0.00272 | 0.00063 | 0.00821 | 0.09821 | 0.05667 | 0.01 |
| $Q_{nspin} \leq Q_{repl}$ | Frequency | 0.00159 | 0.00367 | 0.01143 | 0.06326 | 0.00548 | 0.01584 |

Table 3a : Ancillary Services Price Inequalities for NP15

| NP15 | | | | | | | |
|--|---------|---------|---------|---------|---------|---------|---------|
| Violates | June | July | Aug. | Sept. | Oct. | Nov., | Dec |
| $P_{reg} \geq P_{spin}$ | 0.54306 | 0.38306 | 0.81989 | 0.99167 | 0.95027 | 0.86111 | 0.13441 |
| $P_{spin} \geq P_{nspin}$ | 0.07639 | 0.5578 | 0.16398 | 0.15278 | 0.02688 | 0.06667 | 0.00806 |
| $P_{nspin} \geq P_{repl}$ | 0.55417 | 0.10887 | 0.23522 | 0.24583 | 0.20161 | 0.13889 | 0.33333 |
| $P_{reg} \geq P_{nspin}$ | 0.39306 | 0.78898 | 0.79167 | 0.99167 | 0.94758 | 0.84306 | 0.02016 |
| $P_{reg} \geq P_{repl}$ | 0.36528 | 0.70565 | 0.79167 | 0.89583 | 0.63306 | 0.73333 | 0.01478 |
| $P_{spin} \geq P_{repl}$ | 0.08194 | 0.48387 | 0.15054 | 0.04028 | 0.00403 | 0.00278 | 0 |
| $P_{px} \geq \max \{ P_{spin}, P_{nspin}, P_{repl} \}$ | 0.16111 | 0.0672 | 0.06586 | 0.025 | 0 | 0 | 0.00672 |
| $P_{real} \geq \max \{ P_{spin}, P_{nspin}, P_{repl} \}$ | 0.45417 | 0.14113 | 0.06855 | 0.01389 | 0.00134 | 0 | 0.00538 |

Table 3b : Ancillary Services Price Inequalities for SP15

| SP15 | | | | | | | |
|--|---------|---------|---------|---------|---------|---------|---------|
| Violates | June | July | Aug. | Sept. | Oct. | Nov., | Dec. |
| $P_{reg} \geq P_{spin}$ | 0.55 | 0.68548 | 0.80914 | 0.9875 | 0.95027 | 0.86111 | 0.14382 |
| $P_{spin} \geq P_{nspin}$ | 0.07639 | 0.04973 | 0.09677 | 0.12361 | 0.02688 | 0.06667 | 0.00403 |
| $P_{nspin} \geq P_{repl}$ | 0.5625 | 0.30376 | 0.24866 | 0.20139 | 0.20161 | 0.13889 | 0.33602 |
| $P_{reg} \geq P_{nspin}$ | 0.39444 | 0.62769 | 0.77823 | 0.9875 | 0.94758 | 0.84306 | 0.02016 |
| $P_{reg} \geq P_{repl}$ | 0.36667 | 0.56586 | 0.77151 | 0.89444 | 0.63306 | 0.73333 | 0.01075 |
| $P_{spin} \geq P_{repl}$ | 0.08194 | 0.09543 | 0.10484 | 0.0375 | 0.00403 | 0.00278 | 0 |
| $P_{px} \geq \max \{ P_{spin}, P_{nspin}, P_{repl} \}$ | 0.16111 | 0.02151 | 0.0672 | 0.025 | 0 | 0 | 0.00672 |
| $P_{real} \geq \max \{ P_{spin}, P_{nspin}, P_{repl} \}$ | 0.4375 | 0.0457 | 0.06586 | 0.02778 | 0.00134 | 0.00139 | 0.00538 |