### Appendix II-A: Supporting Tables for Analysis of Reliant Natural Gas Transactions

#### Table II-A1. EOL Western Gas Spot Trades, November 2000 – June 2001, Counterparties With the Greatest Daily Gross Trading (continued on next page)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Location</th>
<th>Transaction Date</th>
<th>Counterparty</th>
<th>Gross Quantity (MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SoCal Topock EPNG</td>
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<td>Reliant Energy Services, Inc.</td>
<td>3,705,000</td>
</tr>
<tr>
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<td>SoCal Topock EPNG</td>
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<td>Reliant Energy Services, Inc.</td>
<td>2,280,000</td>
</tr>
<tr>
<td>3</td>
<td>SoCal Topock EPNG</td>
<td>12/15/00</td>
<td>Reliant Energy Services, Inc.</td>
<td>1,824,000</td>
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<tr>
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<tr>
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<tr>
<td>8</td>
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<tr>
<td>27</td>
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<td>Southern California Gas Company</td>
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<tr>
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<tr>
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<td>PG&amp;E Clygtes Pool</td>
<td>5/4/01</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>555,000</td>
</tr>
</tbody>
</table>

1Gross quantity is adjusted for the duration of the contract: a 1-day spot contract for 10,000 MMBtu/d would contribute 10,000 MMBtu to the gross quantity, while a 3-day weekend spot contract for 10,000 MMBtu/d would contribute 30,000 MMBtu to the gross quantity. Almost all spot contracts are for 1 or 3 days, although contracts for holiday weekends are generally for 4 days and contracts for the Thanksgiving weekend are for 5 days.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Location</th>
<th>Transaction Date</th>
<th>Counterparty</th>
<th>Gross Quantity (MMBtu)</th>
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<tr>
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<td>34</td>
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<td>Dynegy Marketing and Trade</td>
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</tr>
<tr>
<td>36</td>
<td>SoCal Topock EPNG</td>
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### Table II-A2. EOL Western Gas Spot Trades, November 2000 – June 2001, Counterparties With the Greatest Daily Net Purchases (continued on next page)

<table>
<thead>
<tr>
<th>Rank</th>
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<th>Transaction Date</th>
<th>Counterparty</th>
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<td>Reliant Energy Services, Inc.</td>
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<td>1,356,000</td>
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<td>SoCal Topock EPNG</td>
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<td>Reliant Energy Services, Inc.</td>
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<td>900,000</td>
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<tr>
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<td>SoCal Topock EPNG</td>
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<td>780,000</td>
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<td>690,000</td>
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<tr>
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<td>PG&amp;E Ctygte Pool</td>
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<td>Duke Energy Trading and Marketing, L.L.C.</td>
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<td>600,000</td>
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<td>Dynegy Marketing and Trade</td>
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<td>560,000</td>
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<td>SoCal Topock EPNG</td>
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<td>12/8/00</td>
<td>Reliant Energy Services, Inc.</td>
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<td>540,000</td>
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<tr>
<td>15</td>
<td>EPNG SoCal Ehrenberg</td>
<td>3/2/01</td>
<td>Reliant Energy Services, Inc.</td>
<td>1,215,000</td>
<td>495,000</td>
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<tr>
<td>16</td>
<td>SoCal Topock EPNG</td>
<td>11/17/00</td>
<td>Reliant Energy Services, Inc.</td>
<td>780,000</td>
<td>480,000</td>
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<tr>
<td>17</td>
<td>SoCal Topock EPNG</td>
<td>11/27/00</td>
<td>Reliant Energy Services, Inc.</td>
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<td>450,000</td>
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<tr>
<td>23</td>
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<td>380,000</td>
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<td>Reliant Energy Services, Inc.</td>
<td>710,000</td>
<td>370,000</td>
</tr>
</tbody>
</table>

2Gross quantity and net purchases are adjusted for the duration of the contract: buying a 1-day spot contract for 10,000 MMBtu/d would contribute 10,000 MMBtu to the gross quantity and net purchases, while buying a 3-day weekend spot contract for 10,000 MMBtu/d would contribute 30,000 MMBtu to the gross quantity and net purchases. Almost all spot contracts are for 1 or 3 days, although contracts for holiday weekends are generally for 4 days and contracts for the Thanksgiving weekend are for 5 days.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Location</th>
<th>Transaction Date</th>
<th>Counterparty</th>
<th>Gross Quantity (MMBtu)</th>
<th>Net Purchases (MMBtu)</th>
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<tr>
<td>33</td>
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<td>Reliant Energy Services, Inc.</td>
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<td>370,000</td>
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<td>330,000</td>
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<td>37</td>
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<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>390,000</td>
<td>330,000</td>
</tr>
<tr>
<td>38</td>
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<td>Reliant Energy Services, Inc.</td>
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<td>330,000</td>
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</table>
Table II-A3. EOL Western Gas Spot Trades, November 2000 – June 2001, Counterparties With the Greatest Daily Net Sales (continued on next page)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Location</th>
<th>Transaction Date</th>
<th>Counterparty</th>
<th>Gross Quantity (MMBtu)(^3)</th>
<th>Net Sales (MMBtu)</th>
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<tr>
<td>3</td>
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<td>525,000</td>
</tr>
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<td>12/22/00</td>
<td>Dynegy Marketing and Trade</td>
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<td>450,000</td>
</tr>
<tr>
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<tr>
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<td>SoCal Topock EPNG</td>
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<td>Aquila Energy Marketing Corporation</td>
<td>420,000</td>
<td>420,000</td>
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<tr>
<td>11</td>
<td>EPNG SoCal Ehrenberg</td>
<td>3/9/01</td>
<td>El Paso Merchant Energy, L.P.</td>
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<td>396,000</td>
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<td>12</td>
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<td>Dynegy Marketing and Trade</td>
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<tr>
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<td>SoCal Topock EPNG</td>
<td>12/8/00</td>
<td>Dynegy Marketing and Trade</td>
<td>390,000</td>
<td>390,000</td>
</tr>
<tr>
<td>14</td>
<td>SoCal Topock EPNG</td>
<td>2/16/01</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>380,000</td>
<td>380,000</td>
</tr>
<tr>
<td>15</td>
<td>EPNG SoCal Ehrenberg</td>
<td>3/2/01</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>360,000</td>
<td>360,000</td>
</tr>
<tr>
<td>16</td>
<td>SoCal Topock EPNG</td>
<td>11/22/00</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>350,000</td>
<td>350,000</td>
</tr>
<tr>
<td>17</td>
<td>SoCal Topock EPNG</td>
<td>1/26/01</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>525,000</td>
<td>345,000</td>
</tr>
<tr>
<td>18</td>
<td>SoCal Topock EPNG</td>
<td>11/3/00</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>345,000</td>
<td>345,000</td>
</tr>
<tr>
<td>19</td>
<td>SoCal Topock EPNG</td>
<td>11/17/00</td>
<td>Aquila Energy Marketing Corporation</td>
<td>720,000</td>
<td>330,000</td>
</tr>
<tr>
<td>20</td>
<td>EPNG SoCal Ehrenberg</td>
<td>3/30/01</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>330,000</td>
<td>330,000</td>
</tr>
<tr>
<td>21</td>
<td>EPNG SoCal Ehrenberg</td>
<td>5/18/01</td>
<td>Reliant Energy Services, Inc.</td>
<td>330,000</td>
<td>330,000</td>
</tr>
<tr>
<td>22</td>
<td>PG&amp;E Ctygte Pool</td>
<td>3/2/01</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>330,000</td>
<td>330,000</td>
</tr>
<tr>
<td>23</td>
<td>SoCal Topock EPNG</td>
<td>11/22/00</td>
<td>Williams Energy Marketing &amp; Trading Company</td>
<td>325,000</td>
<td>325,000</td>
</tr>
<tr>
<td>24</td>
<td>PG&amp;E Ctygte Pool</td>
<td>1/12/01</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>300,000</td>
<td>300,000</td>
</tr>
<tr>
<td>25</td>
<td>SoCal Topock EPNG</td>
<td>11/10/00</td>
<td>Aquila Energy Marketing Corporation</td>
<td>300,000</td>
<td>300,000</td>
</tr>
<tr>
<td>26</td>
<td>SoCal Topock EPNG</td>
<td>12/22/00</td>
<td>Aquila Energy Marketing Corporation</td>
<td>300,000</td>
<td>300,000</td>
</tr>
<tr>
<td>27</td>
<td>EPNG SoCal Ehrenberg</td>
<td>3/16/01</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>285,000</td>
<td>285,000</td>
</tr>
<tr>
<td>28</td>
<td>EPNG SoCal Ehrenberg</td>
<td>6/15/01</td>
<td>Reliant Energy Services, Inc.</td>
<td>285,000</td>
<td>285,000</td>
</tr>
<tr>
<td>29</td>
<td>SoCal Topock EPNG</td>
<td>1/19/01</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>285,000</td>
<td>285,000</td>
</tr>
<tr>
<td>30</td>
<td>SoCal Topock EPNG</td>
<td>1/12/01</td>
<td>Williams Energy Marketing &amp; Trading Company</td>
<td>280,000</td>
<td>280,000</td>
</tr>
<tr>
<td>31</td>
<td>PG&amp;E Ctygte Pool</td>
<td>1/19/01</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>270,000</td>
<td>270,000</td>
</tr>
<tr>
<td>32</td>
<td>SoCal Topock EPNG</td>
<td>2/2/01</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>270,000</td>
<td>270,000</td>
</tr>
</tbody>
</table>

\(^3\)Gross quantity and net sales are adjusted for the duration of the contract: selling a 1-day spot contract for 10,000 MMBtu/d would contribute 10,000 MMBtu to the gross quantity and net sales, while selling a 3-day weekend spot contract for 10,000 MMBtu/d would contribute 30,000 MMBtu to the gross quantity and net sales. Almost all spot contracts are for 1 or 3 days, although contracts for holiday weekends are generally for 4 days and contracts for the Thanksgiving weekend are for 5 days.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Location</th>
<th>Transaction Date</th>
<th>Counterparty</th>
<th>Gross Quantity (MMBtu)</th>
<th>Net Sales (MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>PG&amp;E Ctygle Pool</td>
<td>5/25/01</td>
<td>Calpine Energy Services, L.P.</td>
<td>260,000</td>
<td>260,000</td>
</tr>
<tr>
<td>34</td>
<td>SoCal Topock EPNG</td>
<td>1/5/01</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>255,000</td>
<td>255,000</td>
</tr>
<tr>
<td>35</td>
<td>SoCal Topock EPNG</td>
<td>2/2/01</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>255,000</td>
<td>255,000</td>
</tr>
<tr>
<td>36</td>
<td>PG&amp;E Ctygle Pool</td>
<td>11/10/00</td>
<td>Aquila Energy Marketing Corporation</td>
<td>480,000</td>
<td>240,000</td>
</tr>
<tr>
<td>37</td>
<td>EPNG SoCal Ehrenberg</td>
<td>3/2/01</td>
<td>Southern California Gas Company</td>
<td>240,000</td>
<td>240,000</td>
</tr>
<tr>
<td>38</td>
<td>EPNG SoCal Ehrenberg</td>
<td>4/6/01</td>
<td>Reliant Energy Services, Inc.</td>
<td>240,000</td>
<td>240,000</td>
</tr>
<tr>
<td>39</td>
<td>PG&amp;E Ctygle Pool</td>
<td>4/27/01</td>
<td>Enron Energy Services, Inc.</td>
<td>240,000</td>
<td>240,000</td>
</tr>
<tr>
<td>40</td>
<td>SoCal Topock EPNG</td>
<td>12/8/00</td>
<td>Aquila Energy Marketing Corporation</td>
<td>240,000</td>
<td>240,000</td>
</tr>
</tbody>
</table>
Table II-A4. EOL Topock and Ehrenberg Gas Spot Trades, November 2000 – June 2001, Largest Net Sellers to Enron by Month (continued on next page)

<table>
<thead>
<tr>
<th>Transaction Month</th>
<th>Rank Within Month</th>
<th>Counterparty</th>
<th>Counterparty Net Sales (MMBtu)</th>
<th>Gross Volume (MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov-00</td>
<td>1</td>
<td>Aquila Energy Marketing Corporation</td>
<td>2,615,000</td>
<td>3,575,000</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>2,210,000</td>
<td>2,720,000</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Southern California Gas Company</td>
<td>1,375,000</td>
<td>1,405,000</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>San Diego Gas &amp; Electric Company</td>
<td>595,000</td>
<td>595,000</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>PG&amp;E Energy Trading-Gas Corporation</td>
<td>555,000</td>
<td>785,000</td>
</tr>
<tr>
<td>Dec-00</td>
<td>1</td>
<td>Dynegy Marketing and Trade</td>
<td>3,545,000</td>
<td>3,605,000</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Aquila Energy Marketing Corporation</td>
<td>2,110,000</td>
<td>2,140,000</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Southern California Gas Company</td>
<td>1,807,638</td>
<td>1,827,638</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Mirant Americas Energy Marketing, L.P.</td>
<td>1,381,000</td>
<td>1,381,000</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Enserco Energy, Inc.</td>
<td>917,000</td>
<td>917,000</td>
</tr>
<tr>
<td>Jan-01</td>
<td>1</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>2,720,850</td>
<td>3,280,850</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Williams Energy Marketing &amp; Trading Company</td>
<td>1,020,000</td>
<td>1,020,000</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Coral Energy Resources, L.P.</td>
<td>872,708</td>
<td>892,708</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>741,000</td>
<td>1,821,000</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Aquila Energy Marketing Corporation</td>
<td>439,000</td>
<td>791,000</td>
</tr>
<tr>
<td>Feb-01</td>
<td>1</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>2,806,000</td>
<td>3,086,000</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>1,454,000</td>
<td>1,884,000</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Aquila Energy Marketing Corporation</td>
<td>595,000</td>
<td>935,000</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Mirant Americas Energy Marketing, L.P.</td>
<td>524,000</td>
<td>554,000</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Southern California Gas Company</td>
<td>332,500</td>
<td>332,500</td>
</tr>
<tr>
<td>Mar-01</td>
<td>1</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>5,484,000</td>
<td>5,624,000</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Southern California Gas Company</td>
<td>790,000</td>
<td>1,080,000</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Aquila Energy Marketing Corporation</td>
<td>641,000</td>
<td>1,037,000</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Texaco Natural Gas Inc.</td>
<td>391,000</td>
<td>391,000</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Burlington Resources Trading Inc.</td>
<td>215,808</td>
<td>215,808</td>
</tr>
</tbody>
</table>

Note: Net sales and gross quantity are adjusted for the duration of the contract: selling a 1-day spot contract for 10,000 MMBtu/d would contribute 10,000 MMBtu to the net sales and gross quantity, while buying a 3-day weekend spot contract for 10,000 MMBtu/d would contribute 30,000 MMBtu to the net sales and gross quantity. Almost all spot contracts are for 1 or 3 days, although contracts for holiday weekends are generally for 4 days and contracts for the Thanksgiving weekend are for 5 days.
<table>
<thead>
<tr>
<th>Transaction Month</th>
<th>Rank Within Month</th>
<th>Counterparty</th>
<th>Counterparty Net Sales (MMBtu)</th>
<th>Gross Volume (MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr-01</td>
<td>1</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>2,653,488</td>
<td>2,763,488</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>1,037,754</td>
<td>1,177,754</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Mirant Americas Energy Marketing, L.P.</td>
<td>944,767</td>
<td>944,767</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Coral Energy Resources, L.P.</td>
<td>941,000</td>
<td>979,000</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Southern California Gas Company</td>
<td>500,000</td>
<td>520,000</td>
</tr>
<tr>
<td>May-01</td>
<td>1</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>2,114,222</td>
<td>2,634,222</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Enserco Energy, Inc.</td>
<td>530,000</td>
<td>570,000</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Calpine Energy Services, L.P.</td>
<td>380,500</td>
<td>878,500</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>PG&amp;E Energy Trading-Gas Corporation</td>
<td>169,598</td>
<td>169,598</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>AEP Energy Services, Inc.</td>
<td>144,022</td>
<td>864,022</td>
</tr>
<tr>
<td>Jun-01</td>
<td>1</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>888,646</td>
<td>1,158,646</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Mirant Americas Energy Marketing, L.P.</td>
<td>601,238</td>
<td>601,238</td>
</tr>
<tr>
<td></td>
<td>3</td>
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<td>566,336</td>
<td>1,056,336</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Aquila Energy Marketing Corporation</td>
<td>523,162</td>
<td>749,262</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BP Energy Company</td>
<td>392,500</td>
<td>432,500</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>El Paso Merchant Energy, L.P.</td>
<td>14,365,046</td>
<td>16,985,046</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>7,486,100</td>
<td>12,420,100</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Aquila Energy Marketing Corporation</td>
<td>7,268,162</td>
<td>10,414,262</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Southern California Gas Company</td>
<td>5,014,188</td>
<td>6,134,188</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Mirant Americas Energy Marketing, L.P.</td>
<td>4,202,889</td>
<td>4,312,889</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Coral Energy Resources, L.P.</td>
<td>2,632,665</td>
<td>4,448,623</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Williams Energy Marketing &amp; Trading Company</td>
<td>2,566,134</td>
<td>4,336,134</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Dynegy Marketing and Trade</td>
<td>1,853,013</td>
<td>11,778,971</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Enserco Energy, Inc.</td>
<td>1,808,500</td>
<td>2,398,500</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>BP Energy Company</td>
<td>1,696,000</td>
<td>2,491,000</td>
</tr>
</tbody>
</table>
## Table II-A5. EOL Western Gas Spot Trades, November 2000 – June 2001, Counterparties With the Greatest Monthly Net Purchases

<table>
<thead>
<tr>
<th>Rank</th>
<th>Location</th>
<th>Transaction Month</th>
<th>Counterparty</th>
<th>Gross Quantity (MMBtu)</th>
<th>Net Purchases (MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SoCal Topock EPNG</td>
<td>December 2000</td>
<td>Reliant Energy Services, Inc.</td>
<td>15,296,000</td>
<td>8,024,000</td>
</tr>
<tr>
<td>2</td>
<td>SoCal Topock EPNG</td>
<td>February 2001</td>
<td>Reliant Energy Services, Inc.</td>
<td>11,422,500</td>
<td>7,227,500</td>
</tr>
<tr>
<td>3</td>
<td>SoCal Topock EPNG</td>
<td>January 2001</td>
<td>Reliant Energy Services, Inc.</td>
<td>8,438,350</td>
<td>6,131,650</td>
</tr>
<tr>
<td>5</td>
<td>SoCal Topock EPNG</td>
<td>November 2000</td>
<td>Reliant Energy Services, Inc.</td>
<td>5,172,000</td>
<td>2,188,000</td>
</tr>
<tr>
<td>6</td>
<td>Opal</td>
<td>April 2001</td>
<td>BP Energy Company</td>
<td>2,391,266</td>
<td>2,044,942</td>
</tr>
<tr>
<td>7</td>
<td>SoCal Topock EPNG</td>
<td>May 2001</td>
<td>Reliant Energy Services, Inc.</td>
<td>1,934,479</td>
<td>1,914,479</td>
</tr>
<tr>
<td>8</td>
<td>PG&amp;E Ctygte Pool</td>
<td>January 2001</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>2,815,000</td>
<td>1,885,000</td>
</tr>
<tr>
<td>9</td>
<td>PG&amp;E Ctygte Pool</td>
<td>November 2000</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>3,075,000</td>
<td>1,735,000</td>
</tr>
<tr>
<td>10</td>
<td>SoCal Topock EPNG</td>
<td>June 2001</td>
<td>Reliant Energy Services, Inc.</td>
<td>2,635,059</td>
<td>1,542,059</td>
</tr>
<tr>
<td>11</td>
<td>Waha</td>
<td>March 2001</td>
<td>BP Energy Company</td>
<td>1,465,000</td>
<td>1,465,000</td>
</tr>
<tr>
<td>12</td>
<td>EPNG SoCal Ehrenberg</td>
<td>May 2001</td>
<td>Sempra Energy Trading Corp.</td>
<td>1,295,000</td>
<td>1,275,000</td>
</tr>
<tr>
<td>13</td>
<td>Opal</td>
<td>December 2000</td>
<td>Dynegy Marketing and Trade</td>
<td>1,285,000</td>
<td>1,275,000</td>
</tr>
<tr>
<td>14</td>
<td>PGT Malin</td>
<td>November 2000</td>
<td>Dynegy Marketing and Trade</td>
<td>1,480,000</td>
<td>1,255,000</td>
</tr>
<tr>
<td>15</td>
<td>PG&amp;E Topock</td>
<td>June 2001</td>
<td>PG&amp;E Energy Trading-Gas Corporation</td>
<td>1,243,030</td>
<td>1,199,030</td>
</tr>
<tr>
<td>16</td>
<td>PG&amp;E Ctygte Pool</td>
<td>April 2001</td>
<td>Mirant Americas Energy Marketing, L.P.</td>
<td>1,065,000</td>
<td>1,065,000</td>
</tr>
<tr>
<td>17</td>
<td>PG&amp;E Ctygte Pool</td>
<td>June 2001</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>1,599,500</td>
<td>1,059,500</td>
</tr>
<tr>
<td>18</td>
<td>SoCal Topock EPNG</td>
<td>January 2001</td>
<td>Dynegy Marketing and Trade</td>
<td>1,384,000</td>
<td>1,034,000</td>
</tr>
<tr>
<td>19</td>
<td>Waha</td>
<td>April 2001</td>
<td>BP Energy Company</td>
<td>960,000</td>
<td>960,000</td>
</tr>
<tr>
<td>20</td>
<td>SoCal Topock EPNG</td>
<td>April 2001</td>
<td>Reliant Energy Services, Inc.</td>
<td>1,570,000</td>
<td>950,000</td>
</tr>
<tr>
<td>21</td>
<td>Waha</td>
<td>February 2001</td>
<td>BP Energy Company</td>
<td>955,000</td>
<td>935,000</td>
</tr>
<tr>
<td>22</td>
<td>EPNG SoCal Ehrenberg</td>
<td>May 2001</td>
<td>Reliant Energy Services, Inc.</td>
<td>2,205,000</td>
<td>915,000</td>
</tr>
<tr>
<td>23</td>
<td>PG&amp;E Ctygte Pool</td>
<td>April 2001</td>
<td>Duke Energy Trading and Marketing, L.L.C.</td>
<td>1,290,000</td>
<td>860,000</td>
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<td>November 2000</td>
<td>Coast Energy Canada, Inc.</td>
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<td>25</td>
<td>Waha</td>
<td>June 2001</td>
<td>Duke Energy Field Services Marketing, LLC</td>
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<tr>
<td>26</td>
<td>Opal</td>
<td>November 2000</td>
<td>Dynegy Marketing and Trade</td>
<td>910,000</td>
<td>820,000</td>
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<tr>
<td>27</td>
<td>PG&amp;E Ctygte Pool</td>
<td>November 2000</td>
<td>Pacific Gas &amp; Electric Company</td>
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<td>820,000</td>
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<td>28</td>
<td>Opal</td>
<td>November 2000</td>
<td>Cook Inlet Energy Supply L.L.C.</td>
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<td>29</td>
<td>PG&amp;E Ctygte Pool</td>
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<td>675,000</td>
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<td>PGT Malin</td>
<td>February 2001</td>
<td>Enron Energy Services, Inc.</td>
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<td>655,000</td>
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<tr>
<td>31</td>
<td>EPNG SoCal Ehrenberg</td>
<td>June 2001</td>
<td>Sempra Energy Trading Corp.</td>
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<td>637,500</td>
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<tr>
<td>32</td>
<td>Opal</td>
<td>December 2000</td>
<td>Barrett Resources Corporation</td>
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<td>615,000</td>
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</table>

Gross quantity and net purchases are adjusted for the duration of the contract: buying a 1-day spot contract for 10,000 MMBtu/d would contribute 10,000 MMBtu to the gross quantity and net purchases, while buying a 3-day weekend spot contract for 10,000 MMBtu/d would contribute 30,000 MMBtu to the gross quantity and net sales. Almost all spot contracts are for 1 or 3 days, although contracts for holiday weekends are generally for 4 days and contracts for the Thanksgiving weekend are for 5 days.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Transaction Date</th>
<th>Counterparty</th>
<th>Number of Transactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/31/01</td>
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<tr>
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<td>12/11/00</td>
<td>Reliant Energy Services, Inc.</td>
<td>136</td>
</tr>
<tr>
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<td>2/2/01</td>
<td>Reliant Energy Services, Inc.</td>
<td>124</td>
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<tr>
<td>4</td>
<td>12/5/00</td>
<td>Reliant Energy Services, Inc.</td>
<td>89</td>
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<tr>
<td>5</td>
<td>12/1/00</td>
<td>Reliant Energy Services, Inc.</td>
<td>76</td>
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<tr>
<td>6</td>
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<td>8</td>
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<td>Reliant Energy Services, Inc.</td>
<td>72</td>
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<tr>
<td>9</td>
<td>12/7/00</td>
<td>Reliant Energy Services, Inc.</td>
<td>71</td>
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<tr>
<td>10</td>
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<td>Reliant Energy Services, Inc.</td>
<td>71</td>
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<tr>
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<td>67</td>
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<td>66</td>
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<tr>
<td>13</td>
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<tr>
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<tr>
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<tr>
<td>18</td>
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<td>52</td>
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<tr>
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<td>21</td>
<td>12/8/00</td>
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<tr>
<td>22</td>
<td>12/18/00</td>
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<td>48</td>
</tr>
<tr>
<td>23</td>
<td>2/12/01</td>
<td>Reliant Energy Services, Inc.</td>
<td>47</td>
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<tr>
<td>24</td>
<td>2/22/01</td>
<td>Reliant Energy Services, Inc.</td>
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<td>1/16/01</td>
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<td>1/26/01</td>
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<tr>
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<td>3/2/01</td>
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<td>5/10/01</td>
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Table II-A7. Purchases and Sales of at Least 100,000 MMBtu/d by Counterparty and Location (Topock and Ehrenberg Combined)

<table>
<thead>
<tr>
<th>Counterparty</th>
<th>Location</th>
<th>Transaction Date</th>
<th>Number of Transactions</th>
<th>Sell (MMBtu/d)</th>
<th>Buy (MMBtu/d)</th>
<th>Gross Volume (MMBtu/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliant Energy Services, Inc.</td>
<td>SoCal Topock</td>
<td>11/1/00</td>
<td>21</td>
<td>100,000</td>
<td>100,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Duke Energy Trading and Marketing, LLC</td>
<td>PG&amp;E Ctygte</td>
<td>11/9/00</td>
<td>34</td>
<td>125,000</td>
<td>185,000</td>
<td>310,000</td>
</tr>
<tr>
<td>Reliant Energy Services, Inc.</td>
<td>SoCal Topock</td>
<td>11/13/00</td>
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<td>190,000</td>
<td>200,000</td>
<td>390,000</td>
</tr>
<tr>
<td>Aquila Energy Marketing Corporation</td>
<td>SoCal Topock</td>
<td>11/16/00</td>
<td>28</td>
<td>170,000</td>
<td>100,000</td>
<td>270,000</td>
</tr>
<tr>
<td>Reliant Energy Services, Inc.</td>
<td>SoCal Topock</td>
<td>11/30/00</td>
<td>51</td>
<td>182,000</td>
<td>320,000</td>
<td>502,000</td>
</tr>
<tr>
<td>Reliant Energy Services, Inc.</td>
<td>SoCal Topock</td>
<td>12/1/00</td>
<td>76</td>
<td>250,000</td>
<td>510,000</td>
<td>760,000</td>
</tr>
<tr>
<td>Reliant Energy Services, Inc.</td>
<td>SoCal Topock</td>
<td>12/4/00</td>
<td>52</td>
<td>203,000</td>
<td>310,000</td>
<td>513,000</td>
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<td>SoCal Topock</td>
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<td>311,000</td>
<td>600,000</td>
<td>911,000</td>
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<td>803,000</td>
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<td>Reliant Energy Services, Inc.</td>
<td>SoCal Topock</td>
<td>12/7/00</td>
<td>71</td>
<td>220,000</td>
<td>480,000</td>
<td>700,000</td>
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<td>SoCal Topock</td>
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<td>480,000</td>
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<td>Reliant Energy Services, Inc.</td>
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<td>12/13/00</td>
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<td>773,000</td>
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<td>Reliant Energy Services, Inc.</td>
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<td>12/19/00</td>
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<td>470,000</td>
<td>670,000</td>
</tr>
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<td>1/3/01</td>
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<td>1,740,000</td>
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<td>2/13/01</td>
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<td>170,000</td>
<td>540,000</td>
<td>710,000</td>
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<td>Reliant Energy Services, Inc.</td>
<td>SoCal Topock</td>
<td>2/28/01</td>
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<td>120,000</td>
<td>210,000</td>
<td>330,000</td>
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### Table II-A8. December 2000 Price Chart, Gas Daily Index and EOL Prices With Churn Day Indication

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<th>Contracted Flow Date or Flow Period</th>
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<th>Gas Daily Midpoint Price ($/MMBtu)</th>
<th>EOL High ($/MMBtu)</th>
<th>EOL Low ($/MMBtu)</th>
<th>Weighted Price ($/MMBtu)</th>
<th>EOL Opening Price ($/MMBtu)</th>
<th>EOL Closing Price ($/MMBtu)</th>
<th>Reliant Churn Day</th>
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<tbody>
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<td>18.89</td>
<td>17.00</td>
<td>18.25</td>
<td>Yes</td>
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<tr>
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<td>12/2 – 12/4/00</td>
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<td>20.25</td>
<td>17.00</td>
<td>18.80</td>
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<td>23.25</td>
<td>19.00</td>
<td>21.80</td>
<td>19.00</td>
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<tr>
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<td>18.50</td>
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Table II-A9. EOL Western Gas Spot Trades, November 2000 – June 2001, Most Trades Within a Clock Minute\(^6\) (continued on next page)

<table>
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<tr>
<th>Rank</th>
<th>Location</th>
<th>Transaction Date</th>
<th>Counterparty</th>
<th>Number of Transactions</th>
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</thead>
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<tr>
<td>1</td>
<td>SoCal Topock EPNG</td>
<td>2/2/01</td>
<td>Reliant Energy Services, Inc.</td>
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<td>SoCal Topock EPNG</td>
<td>2/2/01</td>
<td>Reliant Energy Services, Inc.</td>
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<tr>
<td>3</td>
<td>SoCal Topock EPNG</td>
<td>2/2/01</td>
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<tr>
<td>4</td>
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\(^6\)A clock minute is defined as starting at, for example, 8:51:00 and extending to 8:51:59.
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Table II-A10. EOL Western Gas Spot Trades, November 2000 – June 2001, Most Trades Within 5 Clock Minutes\(^7\) (continued on next page)

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\(^7\)A period of 5 clock minutes is defined as starting at, for example, 8:51:00 and extending to 8:55:59.
## Appendix II-A

### Docket No. PA02-2-000

#### II-A-16

**Price Manipulation in Western Markets**

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\(^8\)These are the longest sequences of transactions for spot gas at a single location that are buy or sell transactions by a single firm.
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Appendix II-A

### Table II-A12. EOL Western Gas Spot Trades, November 2000 – June 2001, Most Consecutive “Buy” Transactions By One Firm

(continued on next page)

<table>
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<th>Consecutive Transactions</th>
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</tr>
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These are the longest sequences of transactions for spot gas at a single location that are buy transactions by a single firm.
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<thead>
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<th>Transaction Date</th>
<th>Counterparty</th>
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Table II-A13. EOL Western Gas Spot Trades, November 2000 – June 2001, Most Consecutive “Sell” Transactions By One Firm\(^\text{10}\) (continued on next page)

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<th>Counterparty</th>
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<td>4</td>
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\(^{10}\)These are the longest sequences of transactions for spot gas at a single location that are sell transactions by a single firm.
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### Table II-A14. Reliant's Profit From EOL-Reliant Netting Agreement, Highest Daily Profit From the Netting Agreement ($100,000 or More)

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<th>Reliant Selling to EOL</th>
<th>Reliant Buying From EOL</th>
<th>Reliant's Net Buy From EOL</th>
<th>Profit From the Netting Agreement</th>
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<td>Transactions (MMBtu)</td>
<td>Price</td>
<td>Transactions (MMBtu)</td>
<td>Price</td>
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<td></td>
<td>Volume (MMBtu)</td>
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</table>

19 Days Churn Days: 14
420 MMBtu Total Volume: 6,540,500

777 MMBtu Total Volume: 12,630,000

6,089,500 Total Profit on the Churn Days: $7,047,590
86.07%

Total Profit on the other Days: $1,140,243
13.93%
Table II-A15. EOL-Reliant Netting Agreement’s Impact on Physical Spot Trading Outcomes, 
Highest Daily Profit From the Netting Agreement ($100,000 or More)

<table>
<thead>
<tr>
<th>Transaction Date</th>
<th>Churn Day</th>
<th>Profit From the Netting Agreement</th>
<th>Average Buy Price</th>
<th>GasDaily SoCal Large Packages Midpoint Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Without the Netting Agreement</td>
<td>Applying Profit From the Netting Agreement, Assuming 60% Flow</td>
</tr>
<tr>
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<td>Yes</td>
<td>$1,622,025</td>
<td>$51.24</td>
<td>$46.85</td>
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<td>$1,584,545</td>
<td>$51.28</td>
<td>$49.32</td>
</tr>
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<td>$558,156</td>
<td>N/A(^1)</td>
<td>N/A(^1)</td>
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<td>$431,267</td>
<td>$12.08</td>
<td>$11.05</td>
</tr>
<tr>
<td>02/13/01</td>
<td>Yes</td>
<td>$421,343</td>
<td>$33.16</td>
<td>$32.40</td>
</tr>
<tr>
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<td>Yes</td>
<td>$369,726</td>
<td>$15.61</td>
<td>$15.38</td>
</tr>
<tr>
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<td>$24.19</td>
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<td>$18.31</td>
<td>$18.01</td>
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<tr>
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<td>N/A(^12)</td>
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<td>$35.12</td>
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<td>$14.90</td>
</tr>
<tr>
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<td>$28.54</td>
</tr>
<tr>
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<td>$233,919</td>
<td>$19.20</td>
<td>$17.74</td>
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<tr>
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<td>Yes</td>
<td>$109,255</td>
<td>$19.57</td>
<td>$19.30</td>
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</table>

\(^1\)On March 1, 2001, Reliant bought 160,000 MMBtu on EOL and sold back 155,000 MMBtu. The net purchase, 5,000 MMBtu, is very small relative to the gross volume (only 1.59 percent). The profit generated by the difference between the buy price and the sell price for the 155,000 MMBtu is $558,156.

\(^12\)On March 6, 2001 and November 20, 2000, Reliant was a net seller on EOL.
Appendix II-A

Docket No. PA02-2-000

II-A-25

Price Manipulation in Western Markets

Table II-A16. Reliant’s Profit From EOL-Reliant Netting Agreement for 24 Churn Days

<table>
<thead>
<tr>
<th>Transaction Date</th>
<th>Reliant Selling to EOL</th>
<th></th>
<th></th>
<th>Reliant Buying From EOL</th>
<th></th>
<th></th>
<th></th>
<th>Reliant's Net Buy From EOL</th>
<th></th>
<th></th>
<th>Profit From the Netting Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transactions</td>
<td>Volume (MMBtu)</td>
<td>Price</td>
<td>Transactions</td>
<td>Volume (MMBtu)</td>
<td>Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>10</td>
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<td>$5.07</td>
<td>11</td>
<td>100,000</td>
<td>$5.11</td>
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<td>($4,700)</td>
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<td></td>
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<td>200,000</td>
<td>$7.40</td>
<td>10,000</td>
<td>$3,605</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>$19.82</td>
<td>32</td>
<td>320,000</td>
<td>$18.28</td>
<td>138,000</td>
<td>$280,313</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/01/00</td>
<td>25</td>
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<td>51</td>
<td>1,530,000</td>
<td>$18.75</td>
<td>780,000</td>
<td>$345,000</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12/04/00</td>
<td>21</td>
<td>203,000</td>
<td>$22.54</td>
<td>31</td>
<td>310,000</td>
<td>$21.39</td>
<td>107,000</td>
<td>$233,919</td>
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<td></td>
</tr>
<tr>
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<td>311,000</td>
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<td>60</td>
<td>600,000</td>
<td>$26.22</td>
<td>289,000</td>
<td>$350,617</td>
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<td></td>
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</tr>
<tr>
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<td>313,000</td>
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<td>490,000</td>
<td>$37.78</td>
<td>177,000</td>
<td>$282,265</td>
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<td></td>
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<td>$186,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/08/00</td>
<td>15</td>
<td>450,000</td>
<td>$57.73</td>
<td>33</td>
<td>990,000</td>
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<td>540,000</td>
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<td></td>
<td></td>
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<td>800,000</td>
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</tr>
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<td>1,065,000</td>
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<td>54</td>
<td>540,000</td>
<td>$34.30</td>
<td>370,000</td>
<td>$421,343</td>
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<tr>
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<td>$17,863</td>
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</tr>
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<td>(30,000)</td>
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<td>$4,929</td>
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<tr>
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<td>10</td>
<td>100,000</td>
<td>$14.56</td>
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<tr>
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<td>269,479</td>
<td>$50,950</td>
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</table>

Total Profit $7,267,962
Table II-A17. EOL-Reliant Netting Agreement’s Impact on Physical Spot Trading Outcomes for 24 Churn Days

<table>
<thead>
<tr>
<th>Transaction Date</th>
<th>Profit From the Netting Agreement</th>
<th>Average Buy Price Without the Netting Agreement</th>
<th>Applying Profit From the Netting Agreement, Assuming 60% Flow</th>
<th>GasDaily SoCal Large Packages Midpoint Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/01/00</td>
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<td>N/A(^{13})</td>
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<td>$7.04</td>
<td>$6.79</td>
<td>$7.37</td>
</tr>
<tr>
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<td>$280,313</td>
<td>$16.25</td>
<td>$14.90</td>
<td>$18.90</td>
</tr>
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<td>12/01/00</td>
<td>$345,000</td>
<td>$18.31</td>
<td>$18.01</td>
<td>$18.50</td>
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<tr>
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<td>$19.20</td>
<td>$17.74</td>
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</tr>
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<td>$24.19</td>
<td>$26.60</td>
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<td>$35.12</td>
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<td>$42.28</td>
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<td>$49.32</td>
<td>$54.66</td>
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<td>$20.73</td>
<td>$20.26</td>
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<td>$19.57</td>
<td>$19.30</td>
<td>$19.56</td>
</tr>
<tr>
<td>01/31/01</td>
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<td>$12.08</td>
<td>$11.05</td>
<td>$13.75</td>
</tr>
<tr>
<td>02/02/01</td>
<td>$369,726</td>
<td>$15.61</td>
<td>$15.38</td>
<td>$15.39</td>
</tr>
<tr>
<td>02/13/01</td>
<td>$421,343</td>
<td>$33.16</td>
<td>$32.40</td>
<td>$34.53</td>
</tr>
<tr>
<td>02/28/01</td>
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<td>$13.16</td>
<td>$13.31</td>
<td>$12.96</td>
</tr>
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<td>N/A(^{14})</td>
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</tr>
<tr>
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<td>$27.79</td>
</tr>
<tr>
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<td>$11.04</td>
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Total Profit $7,267,962

---

\(^{13}\)On November 1, 2000, Reliant bought 100,000 MMBtu on EOL and sold back the whole amount. Since the net purchase is zero, the average price cannot be calculated.

\(^{14}\)On March 1, 2001, Reliant bought 160,000 MMBtu on EOL and sold back 155,000 MMBtu. The net purchase, 5,000 MMBtu, is very small relative to the gross volume (only 1.59 percent). The profit generated by the difference between the buy price and the sell price for the 155,000 MMBtu is $558,156.

\(^{15}\)On March 22, 2001 and April 3, 2001, Reliant was a net seller on EOL.
### Table II-A18. Reliant’s Profit From EOL-Reliant Netting Agreement for December 2000 Flow

<table>
<thead>
<tr>
<th>Transaction Date</th>
<th>Churn Day</th>
<th>Reliant Selling to EOL</th>
<th>Reliant Buying From EOL</th>
<th>Reliant’s Net Buy From EOL</th>
<th>Profit From the Netting Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Transactions (Volume (MMBtu)) Price</td>
<td>Transactions (Volume (MMBtu)) Price</td>
<td></td>
<td></td>
</tr>
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<td>19 182,000 $19.82</td>
<td>32 320,000 $18.28</td>
<td>138,000</td>
<td>$280,313</td>
</tr>
<tr>
<td>12/1/00</td>
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<td>25 750,000 $19.21</td>
<td>51 1,530,000 $18.75</td>
<td>780,000</td>
<td>$345,000</td>
</tr>
<tr>
<td>12/4/00</td>
<td>Yes</td>
<td>21 203,000 $22.54</td>
<td>31 310,000 $21.39</td>
<td>107,000</td>
<td>$233,919</td>
</tr>
<tr>
<td>12/5/00</td>
<td>Yes</td>
<td>29 311,000 $27.34</td>
<td>60 600,000 $26.22</td>
<td>289,000</td>
<td>$350,617</td>
</tr>
<tr>
<td>12/6/00</td>
<td>Yes</td>
<td>23 313,000 $38.68</td>
<td>49 490,000 $37.78</td>
<td>177,000</td>
<td>$282,265</td>
</tr>
<tr>
<td>12/7/00</td>
<td>Yes</td>
<td>23 220,000 $43.85</td>
<td>48 480,000 $43.00</td>
<td>260,000</td>
<td>$186,000</td>
</tr>
<tr>
<td>12/8/00</td>
<td>Yes</td>
<td>15 450,000 $57.73</td>
<td>33 990,000 $54.21</td>
<td>540,000</td>
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</tr>
<tr>
<td>12/11/00</td>
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<td>56 554,000 $60.77</td>
<td>80 800,000 $57.84</td>
<td>246,000</td>
<td>$1,622,025</td>
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<tr>
<td>12/12/00</td>
<td>No</td>
<td>8 80,000 $29.38</td>
<td>49 490,000 $30.04</td>
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</tr>
<tr>
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<td>67 665,000 $20.72</td>
<td>557,000</td>
<td>($3,549)</td>
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<tr>
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<td>34 340,000 $19.97</td>
<td>322,000</td>
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Total Profit on the Churn Days $4,990,390
Total Profit on the other Days -$ 23,859
Table II-A19. EOL-Reliant Netting Agreement’s Impact on Physical Spot Trading Outcomes for December 2000 Flow

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Total = $18,033,745
### Table II-A21. Reliant’s Balance-of-Month Swap Trading Activities and Profits, February 6, 2001 – February 24, 2001

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<th>Contract Begin Date</th>
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<th>Counterparty</th>
<th>Profit Generated per Trade</th>
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Total = $3,860,475

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Price Manipulation in Western Markets
Appendix II-B: Econometric Analysis of Impact of Reliant Trading on Gas Prices

Intraday EOL Price Analysis

The dependent variable in the analysis is the percentage price change over a trade day (i.e., the intraday change in spot price, measured as the log ratio of the price of the last EOL trade over the price of the first EOL trade). We present two regressions, one with each measure of Reliant’s churning activity. The period of interest is November 1, 2000 through June 2001.

For the discrete specification of churning, we estimate the following regression:

$$LCO = \beta_0 + \beta_1 \text{BNS100K} + \beta_2 \text{DEC2000} + \beta_3 \text{MONDAY} + \beta_4 \text{LSUMASD} + \beta_5 \text{LNBNDD} + \epsilon,$$

Where:

- LCO is the intraday change in the logarithm of the SoCal spot price.
- BNS100K is a binary variable indicating whether there are buys and sells of at least 100,000 MMBtu/d on a specific day.
- DEC2000 and MONDAY are binary variables indicating that the transaction occurs in December 2000 or for Saturday to Monday flow, respectively.
- LSUMASD and LNBNDD are the interday changes in the logarithms of gas prices at Sumas and San Juan Non-Bondad, respectively.\(^1\)
- \(\epsilon\) captures the remaining unexplained component of LCO.

For the continuous specification of churning, we estimate the same regression as above, but for the second churn measure:

$$LCO = \beta_0 + \beta_1 \text{CHURN} + \beta_2 \text{DEC2000} + \beta_3 \text{MONDAY} + \beta_4 \text{LSUMASD} + \beta_5 \text{LNBNDD} + \epsilon,$$

Where:

- CHURN is the minimum of sales and purchases (in thousands of MMBtu/d).
- All other variables are as previously defined.

\(^1\)We use the *Gas Daily* Midpoint Price Index.
The results for these two models are provided in Table II-B1 and can be interpreted as follows:

♦ For both regression specifications, churning is found to be positively correlated with intraday gas price changes and is statistically significant. Stated differently, when Reliant churned, prices rose.

♦ Changes in gas prices at Sumas and San Juan Non-Bondad, and whether a trade occurs on Friday for weekend flow, are also positively correlated with intraday price changes.

♦ The coefficient on the December 2000 variable is negative, indicating that intraday price changes were smaller (i.e., more negative) during this period.
### Table II-B1. Intraday Regression Results

<table>
<thead>
<tr>
<th>Churn Measure</th>
<th>Regression Variable</th>
<th>Variable Definition</th>
<th>Parameter Estimate (Absolute value of t statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchases and sales of at least 100,000 MMBtu/d</td>
<td>BnS100K</td>
<td>Binary variable indicating whether there are purchases and sales of at least 100,000 MMBtu/d on a specific day</td>
<td>0.0731 (2.74)</td>
</tr>
<tr>
<td></td>
<td>Lsumasd_mid</td>
<td>Logarithm of the interday change in gas price at Sumas</td>
<td>0.4714 (5.82)</td>
</tr>
<tr>
<td></td>
<td>Lnbnndd_mid</td>
<td>Logarithm of the interday change in gas price at San Juan Non-Bondad</td>
<td>0.1941 (1.77)</td>
</tr>
<tr>
<td></td>
<td>Monday</td>
<td>Binary variable indicating that the transaction occurs for Sat-Mon flow</td>
<td>0.0557 (2.43)</td>
</tr>
<tr>
<td></td>
<td>Dec2000</td>
<td>Binary variable indicating that the transaction occurs in December 2000</td>
<td>-0.0678 (2.40)</td>
</tr>
<tr>
<td>Minimum of total sales and total purchases</td>
<td>Churn</td>
<td>Minimum of total purchases and total sales</td>
<td>0.0002 (2.34)</td>
</tr>
<tr>
<td></td>
<td>Lsumasd_mid</td>
<td>Logarithm of the interday change in gas price at Sumas</td>
<td>0.4919 (6.05)</td>
</tr>
<tr>
<td></td>
<td>Lnbnndd_mid</td>
<td>Logarithm of the interday change in gas price at San Juan Non-Bondad</td>
<td>0.1751 (1.55)</td>
</tr>
<tr>
<td></td>
<td>Monday</td>
<td>Binary variable indicating that the transaction occurs for Sat-Mon flow</td>
<td>0.0528 (2.27)</td>
</tr>
<tr>
<td></td>
<td>Dec2000</td>
<td>Binary variable indicating that the transaction occurs in December 2000</td>
<td>-0.0618 (2.19)</td>
</tr>
</tbody>
</table>

### Interday EOL Price Analyses and Counterfactual Gas Prices

The calculation of counterfactual gas prices is based on regression analysis similar to that described in the previous section, with three main differences:

First, we include overnight price changes in our analysis. We analyze the interday price change (i.e., the difference between the average EOL price on a trading day and the price on the next trading day).
Second, we model the churn’s dynamic effect on prices on days subsequent to the churning days by including lags of the churn variables.\(^2\) In other words, we investigate whether today’s churn affects price changes for several days in the future.\(^3\) We estimated our model using different numbers of lags. We found that the effect of churn could not be estimated precisely beyond three lags, so we report results based on the three-lags specifications. Even in some of these specifications, the effects of some lags of churn are not statistically significant. The counterfactual prices that we computed based on regressions including greater numbers of lags were qualitatively similar.

Third, because we are concerned with price dynamics, we also model general mean-reversion in prices that are independent of the effect of churn. Energy prices tend to mean-revert, at least in the medium to long term. High prices induce further exploration and production, leading to increased supply. To the extent that demand is price-sensitive, high prices may also reduce demand. By inducing additional supply and reducing demand, high current prices tend to lead to lower prices in the future. Conversely, low prices today tend to lead to higher prices in the future.

We model the daily price change on the churn variable, lags of the churn variable, and the difference between the lagged EOL price and an estimate of the equilibrium price. For the interday models with the discrete specification of churning, we estimate the following regression:

\[
\begin{align*}
LCC &= \beta_0 + \beta_1 \text{LAGCH0} + \beta_2 \text{LAGCH1} + \beta_3 \text{LAGCH2} + \beta_4 \text{LAGCH3} + \\
& \quad \quad \beta_5 (\text{LGLGP-\text{EQLOGP}}) + \epsilon,
\end{align*}
\]

Where:

- \(LCC\) is the change in the logarithm of the EOL price from the previous day.
- \(\text{LAGCH0}, \text{LAGCH1}, \text{LAGCH2}, \text{LAGCH3}\) are binary variables indicating whether there are purchases and sales of at least 100,000 MMBtu/d on the day associated with the observation, the previous day, two days earlier, and three days earlier.
- \(\text{LGLGP}\) is the lagged log EOL gas price level.
- \(\text{EQLOGP}\) is the estimated log equilibrium price.
- \(\epsilon\) captures the remaining unexplained component of LCO.

There are two model specifications for each of the two churn definitions (discrete and continuous) for which regressions are performed and counterfactual prices are estimated. These model specifications correspond to alternative methods of specifying the equilibrium price. In the first approach, we include levels of the lagged log price and other independent variables, primarily log prices at various upstream locations, in the regression. Levels of the independent

---

\(^2\)We also include lags of other independent variables in our regressions.

\(^3\)There are at least two possible reasons why the effects of churn might persist beyond the day on which it occurs. First, churning on one day may push up prices on subsequent days if it changes market psychology and generates momentum. Second, because churning does not change fundamental supply and demand conditions, to the extent that churning results in inflated prices one might expect prices to revert to a “normal” level relatively quickly.
variables determine the “equilibrium” level of the log EOL Topock gas price. To the extent that
the lagged log price is above this equilibrium level, prices tend to fall, i.e., price changes are
more negative. To the extent that the lagged log price is below this equilibrium level, prices tend
to rise, i.e., price changes are more positive. Hence, this type of econometric model is sometimes
known as an error-correction model (ECM). Our ECM is specified as follows:

\[
\Delta \log p_t^{EOLT} = \alpha + \beta^{NOV} NOV + \beta^{DEC} DEC + \sum_{j=1}^{5} \beta^{DOW_j} DOW_j + \sum_{i=0}^{1} \left\{ \beta^{CHURN_i} CHURN_{t-i} + \beta^{Sumas_i} \Delta \log p_{t-i}^{Sumas} + \beta^{DShock_i} \Delta \log p_{t-i}^{DShock} \right\} + \beta^{t-1} \sum_{i=0}^{1} \left\{ \gamma^{Sumas_i} \log p_{t-i}^{Sumas} + \gamma^{SJNB_i} \log p_{t-i}^{SJNB} + \gamma^{QASYS} \log QASYS \right\} + \epsilon_t
\]

Where:

♦ \( \Delta \log p_t^{EOLT} \) is the first difference of the log of the EOL Topock price.

♦ \( CHURN_{t-i} \) is the i’th lag of churn.

♦ \( \Delta \log p_{t-i}^{Sumas} \) and \( \Delta \log p_{t-i}^{SJNB} \) are the i’th lags of the first differences of the logs of the Sumas and San Juan Non-Bondad prices.

♦ \( \log DShock_{t-i} \) is the i’th lag of the difference between the log realized ISO system load and the day-ahead forecast.

♦ \( NOV \) and \( DEC \) are dummy variables for the months of November and December.

♦ \( DOW_j \) is a dummy variable for day-of-week \( j \). In the estimation, the constant and all five
day-of-week dummies are collinear and cannot be estimated uniquely, so we drop one of the
day-of-week dummies.

♦ \( \log p_{t-1}^{EOLT} \) is the lagged level of the log of the EOL Topock price.

♦ \( \log p_t^{Sumas} \) and \( \log p_t^{SJNB} \) are the logs of the contemporaneous Sumas and San-Juan Non-Bondad prices.

♦ \( \log QASYS \) is the log of realized ISO system demand.

♦ \( \epsilon_t \) is the error.

In this specification, \( \log p_t^{Sumas} \), \( \log p_t^{SJNB} \), and \( \log QASYS \) determine an equilibrium log price and
\( \lambda \) measures the speed of mean-reversion toward the equilibrium price.

\[\text{4See William Greene,} \ Econometric Analysis, \ 4\text{th ed., Chapter 17, for a brief overview of error-correction and related models.}\]
The second approach is a simplification of the first approach. Rather than modeling an equilibrium price that can change in response to changes in certain variables, we assume that the equilibrium price is fixed, so the regression equation becomes:

\[
\Delta \log p^\text{EOLT}_t = \alpha + \beta^{\text{NOV}} \log p^{\text{NOV}}_t + \beta^{\text{DEC}} \log p^{\text{DEC}}_t + \sum_{j=1}^{5} \beta^\text{DOW}_j \log p^{\text{DOW}}_j + \sum_{i=0}^{3} \left( \beta^{\text{CHURN}_i} \log \text{CHURN}_{t-i} + \beta^{\text{SNUM}}_{i} \log p^{\text{SNUM}}_{t-i} + \beta^{\text{DSHOCK}} \log \text{DSHOCK}_{t-i} \right) + \lambda \left( \log p^{\text{EOLT}}_{t-1} - \phi \right) + \varepsilon_t
\]

where \( \phi \) is the log of the estimated long-run equilibrium price. Note that the equilibrium price cannot be estimated if an additive constant is included in the model, i.e., \( \alpha \) and \( \lambda \phi \) cannot be identified separately.

Which of these models is “better” is ultimately an empirical question. Estimation of the first specification suggests that some of the parameters that determine the equilibrium price, i.e., the \( \gamma \)'s, are statistically significantly different from zero. In other words, the levels of current upstream prices and California load help predict price movements and hence should be included in the model. The second specification is more parsimonious but less completely models price movements.

For the continuous specification of churning, we estimate the same regression as above but with the second churn measure, i.e., the minimum of sales and purchases (in thousands of MMBtu/d). Thus, the variables LAGCH0–LAGCH3 are continuous variables defined as the minimum of sales and purchases for the observation day (LAGCH0) and three prior days (LAGCH1–LAGCH3).

The regression results are summarized in Table II-B2. We report results for four different specifications based on combinations of the churn variable, i.e., a binary churn variable or the actual volume of churn, and the two methods of modeling the equilibrium price. The results of all specifications are similar and show that:

- Churn tends to elevate prices close to when it occurs, but the effect dissipates after several days.
- Mean-reversion seems to be present but is not necessarily statistically significant. In every specification, the coefficient on the lagged log price is negative, i.e., when prices are high they tend to fall, and when prices are low they tend to rise.

The mean-reversion parameter is statistically significant only in the specifications in which we allow the equilibrium price to vary as a function of data.
### Table II-B2. Interday Regression Results

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Coef.</td>
<td>Se</td>
<td>Coef.</td>
</tr>
<tr>
<td><strong>Binary Churn</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Churn Lag</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.0975</td>
<td>0.0243</td>
<td>0.1016</td>
<td>0.2468</td>
</tr>
<tr>
<td>1</td>
<td>0.0664</td>
<td>0.0248</td>
<td>0.0634</td>
<td>0.0251</td>
</tr>
<tr>
<td>2</td>
<td>(0.0560)</td>
<td>0.0243</td>
<td>(0.0628)</td>
<td>0.0247</td>
</tr>
<tr>
<td>3</td>
<td>(0.0125)</td>
<td>0.0240</td>
<td>(0.0189)</td>
<td>0.0243</td>
</tr>
<tr>
<td>Lagged log EOL price</td>
<td>(0.0621)</td>
<td>0.0170</td>
<td>(0.0112)</td>
<td>0.0099</td>
</tr>
<tr>
<td><strong>Continuous Churn</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Churn Lag</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.0003</td>
<td>0.0001</td>
<td>0.0003</td>
<td>0.0001</td>
</tr>
<tr>
<td>1</td>
<td>0.0002</td>
<td>0.0001</td>
<td>0.0002</td>
<td>0.0001</td>
</tr>
<tr>
<td>2</td>
<td>(0.0002)</td>
<td>0.0001</td>
<td>(0.0002)</td>
<td>0.0001</td>
</tr>
<tr>
<td>3</td>
<td>(0.0001)</td>
<td>0.0001</td>
<td>(0.0001)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Lagged log EOL price</td>
<td>(0.0575)</td>
<td>0.0170</td>
<td>(0.0109)</td>
<td>0.0102</td>
</tr>
</tbody>
</table>

All Models: The dependent variable is the change in the log price from the previous day.

Model 1: Time-varying equilibrium price is assumed to be a function of independent variables.

Model 2: Constant equilibrium price is assumed.

Table II-B3 shows how counterfactual prices are calculated from the model for an example day—April 3, 2001, one of the Reliant churn days. This example is illustrative and ignores the effects of mean-reversion. The actual log price change for April 3 (the logarithm of the price change from April 2, 2001 to April 3, 2001) is 0.172. Based on a set of regression results (for Model 1 with discrete churn variable), we estimate that churn raises log prices by 0.098 on the day on which it occurs; therefore, we estimate that the price change in the absence of churn would have been 0.075, the value shown in the fourth column. The sum of this counterfactual price change and the previous period’s price, 2.520, results in an estimated counterfactual log price of 2.595. This log price corresponds to a price in levels of 13.40, the value shown in the seventh column. The counterfactual log price then forms the basis for the subsequent day’s counterfactual price calculation until the fourth day from the churn event, at which point we assume that the actual and counterfactual prices are equal.\(^5\)

---

\(^5\)This illustrative calculation ignores mean-reversion. When mean-reversion is modeled, not only does the counterfactual price for one day form the starting point for the calculation of the counterfactual price on the subsequent day, but it also affects the extent of mean-reversion on the subsequent day.
Table II-B3. Sample Counterfactual Price Calculation

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Apr-01</td>
<td>0</td>
<td>2.520</td>
<td>0.010</td>
<td>0.000</td>
<td>0.010</td>
<td>2.520</td>
<td>12.43</td>
<td>12.43</td>
<td>0.00</td>
</tr>
<tr>
<td>3-Apr-01</td>
<td>1</td>
<td>2.693</td>
<td>0.172</td>
<td>0.098</td>
<td>0.075</td>
<td>2.595</td>
<td>14.77</td>
<td>13.40</td>
<td>1.37</td>
</tr>
<tr>
<td>4-Apr-01</td>
<td>0</td>
<td>2.743</td>
<td>0.051</td>
<td>0.066</td>
<td>-0.016</td>
<td>2.579</td>
<td>15.54</td>
<td>13.19</td>
<td>2.35</td>
</tr>
<tr>
<td>5-Apr-01</td>
<td>0</td>
<td>2.752</td>
<td>0.009</td>
<td>-0.056</td>
<td>0.065</td>
<td>2.645</td>
<td>15.68</td>
<td>14.08</td>
<td>1.60</td>
</tr>
<tr>
<td>6-Apr-01</td>
<td>0</td>
<td>2.664</td>
<td>-0.089</td>
<td>-0.013</td>
<td>-0.076</td>
<td>2.568</td>
<td>14.35</td>
<td>13.05</td>
<td>1.31</td>
</tr>
<tr>
<td>9-Apr-01</td>
<td>0</td>
<td>2.613</td>
<td>-0.051</td>
<td>0.000</td>
<td>-0.051</td>
<td>2.613</td>
<td>13.64</td>
<td>13.64</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Where:

- [1] log mean EOL price
- [2] log mean EOL price - log mean EOL price_{(-1)}
- [3] Effect of churn (regression coefficients on churn binary variable)
- [5] Counterfactual log price (in churn “event” window = [5]_{(-1)} + [4], else = [1])
- [6] Mean EOL price
- [7] Counterfactual price (exp([5]))
Appendix V-A: Details of Data Validation

Introduction

Staff’s long-term transaction data consist of sellers’ responses to Staff’s data request, including backup data in the form of the underlying contracts and contract confirmation notices. We audited contracts and contract confirmations and use this information to validate reported transaction data. In this section, we discuss this audit process and describe how the dataset used for the regression analysis was created.

Auditing Sales Contracts and Confirmations

The first step was to audit contracts and/or contract confirmations to determine if they could be used to validate reported transaction data. To be useful for validation the contract or confirmation had to include name of seller, name of purchaser, sales price, commencement date, termination date, execution date, type of service (flat, on-peak, or off-peak), and delivery point. We also narrowed the number of contracts and confirmations we audited by the following criteria:

♦ Only fixed-price contracts were audited, i.e., contracts with time-varying prices or prices tied to index or fuel prices were not included.
♦ Only contracts for delivery at PV, NP15, SP15, COB, or Mid-C were audited.
♦ Only contracts where the type of service was “on-peak” were audited.

There were 1,630 written contracts or confirmations that met the criteria for auditing. The data entry process was straightforward because the contracts and confirmations were generally unambiguous. To prevent the introduction of error in the audit process, all data entries were double-checked.

The number of audited contracts/confirmations varied widely across sellers. Table V-A1 summarizes the number of audited contracts/confirmations by seller and trading hub.
Table V-A1. Number of Audited Contracts/Confirmations by Seller and Trading Hub

<table>
<thead>
<tr>
<th>Seller</th>
<th>COB</th>
<th>Mid-C</th>
<th>NP15</th>
<th>PV</th>
<th>SP15</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEP</td>
<td>1</td>
<td>1</td>
<td>20</td>
<td>2</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>Avista</td>
<td>4</td>
<td>5</td>
<td>11</td>
<td>11</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>Cargill-Alliant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>City of Burbank</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Coral</td>
<td></td>
<td></td>
<td>75</td>
<td>7</td>
<td>64</td>
<td>146</td>
</tr>
<tr>
<td>Duke</td>
<td>38</td>
<td>79</td>
<td>228</td>
<td>211</td>
<td>233</td>
<td>789</td>
</tr>
<tr>
<td>Dynegy</td>
<td>1</td>
<td>1</td>
<td>11</td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>El Paso Merchant</td>
<td>8</td>
<td>21</td>
<td>57</td>
<td>115</td>
<td>114</td>
<td>315</td>
</tr>
<tr>
<td>Merrill Lynch</td>
<td>3</td>
<td>3</td>
<td>15</td>
<td>6</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Morgan Stanley</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>27</td>
</tr>
<tr>
<td>PSC of New Mexico</td>
<td></td>
<td></td>
<td>47</td>
<td></td>
<td></td>
<td>47</td>
</tr>
<tr>
<td>Reliant</td>
<td>5</td>
<td>2</td>
<td>73</td>
<td>72</td>
<td></td>
<td>154</td>
</tr>
<tr>
<td>Sempra</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Strategic Energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>TransAlta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Williams</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>130</td>
<td>378</td>
<td>512</td>
<td>543</td>
<td>1,630</td>
</tr>
</tbody>
</table>

Of the 1,630 audited contracts/confirmations, 73 transactions were dropped because they were signed before January 1, 2000. We added 26 long-term power purchases by the California Department of Water Resources to the remaining 1,557 audited contracts/confirmations. These contracts have received extensive scrutiny and so their terms are well understood. The California State Auditor’s characterization of these contracts was used.1

Matching Audited Contracts/Confirmations and Reported Transactions

The audited contracts/confirmations were compared with the sales transactions reported by various sellers. The comparison was made using several specifications, including buyer and seller names, contract price and sales amount (MWh), trading hub, type of service, and execution, commencement, and termination dates.

In most cases the match was perfect. In cases where the match was not perfect, a decision was made as to whether a match was “close enough.” Generally, if one field varied slightly between the two data sources but all other fields matched, a match was declared. Specifically, contracts/confirmations were matched with their corresponding reported sale transaction if one of the following conditions was present:

---

♦ Execution dates varied by no more than 1 day and all other fields matched (12 matches).

♦ Prices differed by no more than a few percent and could reasonably be attributed to different interpretations of illegible documents and all other fields matched (28 matches).

♦ Either the commencement date or termination date varied by 1 year, but all other fields matched (9 matches).

♦ Either the commencement or termination day of month varied, but all other fields matched, including commencement or termination month and year (69 matches).

♦ Delivery locations did not match (e.g., PV vs. Mid-C), but all other fields matched (3 matches).

♦ Buyer names did not match, but the different buyers were affiliated (27 matches).

♦ Sales amount varied by no more than 25 MWh, but all other fields matched (117 matches).

All audited contracts/confirmations were matched with reported sales transactions. However, not all sellers provided adequate backup documentation to sufficiently validate their reported sales transactions. Table V-A2 provides the number of reported sales transactions that were adequately documented and not adequately documented by sellers.
Table V-A2. Adequacy of Reported Sales Transaction Documentation

<table>
<thead>
<tr>
<th>Seller</th>
<th>Without Adequate Documentation</th>
<th>With Adequate Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirant</td>
<td>569</td>
<td>-</td>
</tr>
<tr>
<td>Allegheny</td>
<td>170</td>
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Comparison of Regression Results Based on Validated-Only Data and All Data

Since 40 percent of reported sales transactions lack adequate backup documentation, it is important to determine if the inclusion of these transaction data has a significant effect on regression parameter estimates. To address this issue, we ran a basic “twelve bin” regression (described in Appendix V-C) on the two sets of data. The first set included 1,583 validated transactions (1,557 transactions with adequate backup documentation and 26 transactions from publicly available California power purchase contracts). The second set included 1,583 validated transactions and 1,069 unvalidated transactions. Tables V-A3 and V-A4 summarize parameters estimates for each regression run for the “during” and “after” periods.
## Table V-A3. Validated vs. All Comparison: “During” Period

### Validated Transactions

<table>
<thead>
<tr>
<th>Hubs</th>
<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
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<td>With Instrumental Variables (IV)</td>
<td>Ordinary Least Squares (OLS)</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Mid-C/ COB</td>
<td>1-2 Years</td>
<td>-0.34 0.51 -0.67 0.50 0.76 0.65</td>
<td>0.49 0.18 2.71</td>
<td>0.24 0.25 0.94</td>
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<tr>
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<td>3-4 Years</td>
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<td>0.14 0.06 2.56</td>
<td>0.18 0.09 2.22</td>
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<tr>
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<td>5-8 Years</td>
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<td>-0.05 0.05 -1.04</td>
<td>-0.09 0.15 -0.59</td>
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<tr>
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<tr>
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<td>3-4 Years</td>
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<td>0.16 0.05 3.34</td>
<td>0.15 0.05 3.19</td>
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<tr>
<td>PV</td>
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<td>0.32 0.06 5.11</td>
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<td>0.10 0.03 3.26</td>
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<td>0.05 0.04 1.12</td>
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<td>5-8 Years</td>
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<td>0.05 0.04 1.29</td>
<td>0.05 0.04 1.32</td>
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### All Transactions

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<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
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<td>With Instrumental Variables (IV)</td>
<td>Ordinary Least Squares (OLS)</td>
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<td></td>
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</tr>
<tr>
<td>Mid-C/ COB</td>
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<tr>
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<td>3-4 Years</td>
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<td>-0.01 0.03 -0.41</td>
</tr>
<tr>
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<td>3-4 Years</td>
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<td>1-2 Years</td>
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<td>5-8 Years</td>
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### Table V-A4. Validated vs. All Comparison: “After” Period

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<th>Spot Power Estimates</th>
<th>R²</th>
<th>OLS</th>
<th>IV</th>
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<td>Validated Transactions</td>
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<td></td>
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<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Mid-C/COB</td>
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Tables V-A3 and V-A4 show that for most statistically significant estimates, the estimated parameters based only on validated transactions are close to parameter estimates based on all reported transactions, thus implying that the inclusion of unvalidated transaction data in the regression analysis has a minimal effect on our parameter estimates.
### Table V-B1. TFS Historical Forward Gas Prices ($/MMBtu)

<table>
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<th>Month</th>
<th>Delivery Dates</th>
<th>Malin</th>
<th>Southern California Border</th>
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</thead>
<tbody>
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<td>Mar 01</td>
<td>8.34</td>
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<td>7.34</td>
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<tr>
<td>May 01</td>
<td>7.32</td>
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<td>4.66</td>
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<td>Jun 01</td>
<td>4.63</td>
<td>4.33</td>
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### Table V-B2. Williams’ Historical Forward Gas Prices ($/MMBtu)

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### Table V-B3. Enron’s Historical Forward Gas Prices ($/MMBtu)

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Table V-B4. Morgan Stanley’s Historical Forward Gas Prices ($/MMBtu)

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TFS vs. Other Forward Gas Curves

Table V-B5. TFS vs. Williams

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<td>-3%</td>
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<tr>
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<td>4%</td>
<td>0%</td>
<td>-2%</td>
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Table V-B6. TFS vs. Enron

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<td>1%</td>
<td>-7%</td>
<td>-3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 01</td>
<td>7%</td>
<td>-8%</td>
<td>-12%</td>
<td>5%</td>
<td>-6%</td>
<td>-4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jun 01</td>
<td>-5%</td>
<td>-3%</td>
<td>-14%</td>
<td>0%</td>
<td>2%</td>
<td>-2%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table V-B7. TFS vs. Morgan Stanley

<table>
<thead>
<tr>
<th>Month</th>
<th>Southern California Border Delivery Dates</th>
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<tbody>
<tr>
<td></td>
<td>7/1/2001</td>
</tr>
<tr>
<td>Jan 01</td>
<td>6%</td>
</tr>
<tr>
<td>Feb 01</td>
<td>-3%</td>
</tr>
<tr>
<td>Mar 01</td>
<td>-1%</td>
</tr>
<tr>
<td>Apr 01</td>
<td>1%</td>
</tr>
<tr>
<td>May 01</td>
<td>5%</td>
</tr>
<tr>
<td>Jun 01</td>
<td>5%</td>
</tr>
</tbody>
</table>
Appendix V-C: Disaggregated Regressions

The following tables summarize spot power and forward gas parameter estimates for various regression formulations. Each regression includes only on-peak transactions that were executed between January 1, 2000 and June 30, 2001 (“during period”) or between July 1, 2001 and March 31, 2002 (“after period”) for power deliveries at NP15, SP15, COB, PV, or Mid-C. All regressions use TFS’ historic natural gas basis and historic NYMEX forwards at Henry Hub. To address the potential simultaneity of the explanatory variables, we perform both the ordinary least squares (OLS) estimation and the instrumental variable (IV) estimation.

Twelve Bin Regressions

In this formulation we aggregate time-to-delivery class periods 1-2 years, 3-4 years, and 5-8 years and the Mid-C/COB hubs. We then run a separate regression for each combination of aggregated hubs and time-to-delivery classes (i.e., 12 regressions). The results of these regressions are summarized in Tables V-C1 and V-C2.

### Table V-C1. Twelve Bin Regression for “During” Period

<table>
<thead>
<tr>
<th>Hubs</th>
<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
<th>OLS</th>
<th>IV</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ordinary Least Squares (OLS)</td>
<td>With Instrumental Variables (IV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>1-2 Years</td>
<td>0.03</td>
<td>0.27</td>
<td>0.10</td>
<td>0.62</td>
<td>0.42</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.52</td>
<td>0.16</td>
<td>3.15</td>
<td>0.26</td>
<td>0.22</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.40</td>
<td>0.09</td>
<td>4.43</td>
<td>0.63</td>
<td>0.16</td>
<td>3.84</td>
</tr>
<tr>
<td>NP15</td>
<td>1-2 Years</td>
<td>1.09</td>
<td>0.31</td>
<td>3.52</td>
<td>0.82</td>
<td>0.34</td>
<td>2.42</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>1.69</td>
<td>0.26</td>
<td>6.52</td>
<td>1.76</td>
<td>0.31</td>
<td>5.65</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>-0.03</td>
<td>0.26</td>
<td>-0.12</td>
<td>-0.10</td>
<td>0.28</td>
<td>-0.38</td>
</tr>
<tr>
<td>PV</td>
<td>1-2 Years</td>
<td>0.09</td>
<td>0.19</td>
<td>0.49</td>
<td>0.02</td>
<td>0.19</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.42</td>
<td>0.14</td>
<td>3.00</td>
<td>0.46</td>
<td>0.14</td>
<td>3.26</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.10</td>
<td>0.09</td>
<td>1.10</td>
<td>0.10</td>
<td>0.09</td>
<td>1.11</td>
</tr>
<tr>
<td>SP15</td>
<td>1-2 Years</td>
<td>0.27</td>
<td>0.15</td>
<td>1.76</td>
<td>0.51</td>
<td>0.17</td>
<td>2.99</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.28</td>
<td>0.10</td>
<td>2.63</td>
<td>0.29</td>
<td>0.11</td>
<td>2.52</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>-0.23</td>
<td>0.07</td>
<td>-3.49</td>
<td>-0.24</td>
<td>0.07</td>
<td>-3.60</td>
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</table>
### Table V-C2. Twelve Bin Regression for “After” Period

<table>
<thead>
<tr>
<th>Hubs</th>
<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
<th>OLS</th>
<th>IV</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ordinary Least Squares (OLS)</td>
<td>With Instrumental Variables (IV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>1-2 Years</td>
<td>0.73</td>
<td>0.12</td>
<td>6.10</td>
<td>0.61</td>
<td>0.13</td>
<td>4.64</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.76</td>
<td>0.19</td>
<td>3.97</td>
<td>0.87</td>
<td>0.27</td>
<td>3.26</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.22</td>
<td>0.16</td>
<td>1.39</td>
<td>0.04</td>
<td>0.21</td>
<td>0.19</td>
</tr>
<tr>
<td>NP15</td>
<td>1-2 Years</td>
<td>0.71</td>
<td>0.05</td>
<td>13.10</td>
<td>0.68</td>
<td>0.06</td>
<td>12.25</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.72</td>
<td>0.11</td>
<td>6.87</td>
<td>0.65</td>
<td>0.11</td>
<td>5.71</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.38</td>
<td>0.11</td>
<td>3.31</td>
<td>0.28</td>
<td>0.12</td>
<td>2.41</td>
</tr>
<tr>
<td>PV</td>
<td>1-2 Years</td>
<td>0.28</td>
<td>0.18</td>
<td>1.63</td>
<td>0.28</td>
<td>0.18</td>
<td>1.60</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.67</td>
<td>0.16</td>
<td>4.07</td>
<td>0.65</td>
<td>0.16</td>
<td>3.93</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>-0.04</td>
<td>0.22</td>
<td>-0.17</td>
<td>-0.07</td>
<td>-0.22</td>
<td>-0.33</td>
</tr>
<tr>
<td>SP15</td>
<td>1-2 Years</td>
<td>0.70</td>
<td>0.05</td>
<td>13.86</td>
<td>0.72</td>
<td>0.06</td>
<td>12.99</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.70</td>
<td>0.09</td>
<td>7.69</td>
<td>0.69</td>
<td>0.09</td>
<td>7.28</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.78</td>
<td>0.16</td>
<td>4.76</td>
<td>0.79</td>
<td>0.16</td>
<td>4.79</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>0.66</td>
<td>0.04</td>
<td>16.74</td>
<td>0.60</td>
<td>0.05</td>
<td>12.08</td>
<td>0.12</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>0.72</td>
<td>0.05</td>
<td>15.03</td>
<td>0.60</td>
<td>0.07</td>
<td>8.34</td>
<td>0.12</td>
</tr>
<tr>
<td>5-8 Years</td>
<td>0.46</td>
<td>0.06</td>
<td>7.23</td>
<td>0.18</td>
<td>0.10</td>
<td>1.77</td>
<td>0.15</td>
</tr>
</tbody>
</table>

### “Pool by Hub” Regressions

In this formulation, we aggregate time-to-delivery class periods 1-2 years, 3-4 years, and 5-8 years and aggregate all hubs. We run a separate regression for each aggregated time-to-delivery class. The results of these regressions are summarized in Tables V-C3 and V-C4.

### Table V-C3. Pool by Hub Regression for “During” Period

<table>
<thead>
<tr>
<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
<th>OLS</th>
<th>IV</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ordinary Least Squares (OLS)</td>
<td>With Instrumental Variables (IV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 Years</td>
<td>0.29</td>
<td>0.08</td>
<td>3.57</td>
<td>0.46</td>
<td>0.12</td>
<td>3.96</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>0.31</td>
<td>0.06</td>
<td>5.17</td>
<td>0.34</td>
<td>0.07</td>
<td>4.95</td>
</tr>
<tr>
<td>5-8 Years</td>
<td>0.04</td>
<td>0.04</td>
<td>0.82</td>
<td>(0.05)</td>
<td>0.05</td>
<td>(1.10)</td>
</tr>
</tbody>
</table>

### Table V-C4. Pool by Hub Regression for “After” Period

<table>
<thead>
<tr>
<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
<th>OLS</th>
<th>IV</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ordinary Least Squares (OLS)</td>
<td>With Instrumental Variables (IV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 Years</td>
<td>0.66</td>
<td>0.04</td>
<td>16.74</td>
<td>0.60</td>
<td>0.05</td>
<td>12.08</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>0.72</td>
<td>0.05</td>
<td>15.03</td>
<td>0.60</td>
<td>0.07</td>
<td>8.34</td>
</tr>
<tr>
<td>5-8 Years</td>
<td>0.46</td>
<td>0.06</td>
<td>7.23</td>
<td>0.18</td>
<td>0.10</td>
<td>1.77</td>
</tr>
</tbody>
</table>
Pool by Hub Regressions With Additive and Spot Power Interacted Hub Dummies

For each time-to-delivery class, we estimate regressions that include transactions for all hubs. We specify separate intercepts and spot power coefficients for each hub, but constrain the forward gas coefficient to be equal across hubs. Our regression equation is as follows:

\[
\log(FP_{it}) = c \log(FG_{it}) + \sum_i \text{HubDummy}_i \{d_i + b_i \log(SP_{it})\} + e_{it}
\]

where \(d_i\) and \(b_i\) are the hub-specific intercepts and spot power coefficients, respectively. The results of these regressions are summarized in Tables V-C5 and V-C6.

Table V-C5. Pool by Hub Regressions With Additive and Spot Power Interacted Hub Dummies for “During” Period

<table>
<thead>
<tr>
<th>Hub-specific Interacted Dummy on Spot Power</th>
<th>Time-to-Delivery Class</th>
<th>Ordinary Least Squares (OLS)</th>
<th>With Instrumental Variables (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coeff. Std. Err. t-stat</td>
<td>Coeff. Std. Err. t-stat</td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>1-2 Years</td>
<td>0.31 0.05  6.76</td>
<td>0.28 0.05  5.49</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.17 0.03  5.31</td>
<td>0.16 0.03  5.11</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>(0.02) 0.03 (0.56)</td>
<td>(0.01) 0.03 (0.48)</td>
</tr>
<tr>
<td>NP15</td>
<td>1-2 Years</td>
<td>0.42 0.10  4.17</td>
<td>0.39 0.10  3.75</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.21 0.04  5.83</td>
<td>0.21 0.04  5.78</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.07 0.04  1.73</td>
<td>0.07 0.04  1.75</td>
</tr>
<tr>
<td>PV</td>
<td>1-2 Years</td>
<td>0.35 0.04  8.56</td>
<td>0.32 0.05  7.07</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.11 0.02  4.51</td>
<td>0.11 0.02  4.31</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.09 0.02  5.46</td>
<td>0.10 0.02  5.76</td>
</tr>
<tr>
<td>SP15</td>
<td>1-2 Years</td>
<td>0.26 0.07  3.64</td>
<td>0.22 0.08  2.75</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.07 0.03  2.65</td>
<td>0.07 0.03  2.58</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.00 0.02  0.00</td>
<td>0.01 0.02  0.30</td>
</tr>
</tbody>
</table>

Table V-C6. Gas Futures Estimates

<table>
<thead>
<tr>
<th>Time-to-Delivery Class</th>
<th>Ordinary Least Squares (OLS)</th>
<th>With Instrumental Variables (IV)</th>
<th>R^2</th>
<th>OLS</th>
<th>IV</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff. Std. Err. t-stat</td>
<td>Coeff. Std. Err. t-stat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 Years</td>
<td>0.27 0.10 2.63</td>
<td>0.38 0.12 3.08</td>
<td>52%</td>
<td>52%</td>
<td>451</td>
<td></td>
</tr>
<tr>
<td>3-4 Years</td>
<td>0.37 0.07 5.20</td>
<td>0.38 0.08 4.95</td>
<td>57%</td>
<td>56%</td>
<td>398</td>
<td></td>
</tr>
<tr>
<td>5-8 Years</td>
<td>(0.04) 0.04 (1.01)</td>
<td>(0.08) 0.05 (1.79)</td>
<td>60%</td>
<td>60%</td>
<td>217</td>
<td></td>
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</tbody>
</table>
### Table V-C6. Pool by Hub Regressions With Additive and Spot Power Interacted Hub Dummies for “After” Period

<table>
<thead>
<tr>
<th>Hub-specific Interacted Dummy on Spot Power</th>
<th>Time-to-Delivery Class</th>
<th>Ordinary Least Squares (OLS)</th>
<th>With Instrumental Variables (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coeff.</td>
<td>Std. Err.</td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>1-2 Years</td>
<td>0.22</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.21</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.22</td>
<td>0.03</td>
</tr>
<tr>
<td>NP15</td>
<td>1-2 Years</td>
<td>0.11</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>PV</td>
<td>1-2 Years</td>
<td>0.08</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.08</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.10</td>
<td>0.02</td>
</tr>
<tr>
<td>SP15</td>
<td>1-2 Years</td>
<td>0.08</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.10</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.15</td>
<td>0.03</td>
</tr>
</tbody>
</table>

### Gas Futures Estimates

<table>
<thead>
<tr>
<th>Time-to-Delivery Class</th>
<th>Ordinary Least Squares (OLS)</th>
<th>With Instrumental Variables (IV)</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff.</td>
<td>Std. Err.</td>
<td>t-stat</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>0.58</td>
<td>0.05</td>
<td>12.42</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>0.67</td>
<td>0.06</td>
<td>11.01</td>
</tr>
<tr>
<td>5-8 Years</td>
<td>0.34</td>
<td>0.07</td>
<td>4.51</td>
</tr>
</tbody>
</table>

### Pool by Hub Regressions With Spot Power Interacted Hub Dummies

These regressions are identical to those in the previous section except that we exclude hub-specific intercepts. Therefore, the regression equation for each time-to-delivery class is as follows:

$$\log(FP_{it}) = a + c \ \log(FG_{it}) + \sum_i b_i \text{HubDummy}_i * \log(SP_{it}) + e_{it}$$
The results of these regressions are summarized in Tables V-C7 and V-C8.

Table V-C7. Pool by Hub Regressions With Spot Power

Interacted Hub Dummies for “During” Period

<table>
<thead>
<tr>
<th>Hub-specific Interacted Dummy on Spot Power</th>
<th>Time-to-Delivery Class</th>
<th>Ordinary Least Squares (OLS)</th>
<th>With Instrumental Variables (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coeff. Std. Err. t-stat</td>
<td>Coeff. Std. Err. t-stat</td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>1-2 Years</td>
<td>0.32 0.04 8.44</td>
<td>0.28 0.04 6.37</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.14 0.02 7.33</td>
<td>0.14 0.02 7.17</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.05 0.01 3.43</td>
<td>0.05 0.01 3.86</td>
</tr>
<tr>
<td>NP15</td>
<td>1-2 Years</td>
<td>0.35 0.04 9.00</td>
<td>0.31 0.05 6.78</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.12 0.02 5.87</td>
<td>0.12 0.02 5.72</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.06 0.02 3.82</td>
<td>0.07 0.02 4.30</td>
</tr>
<tr>
<td>PV</td>
<td>1-2 Years</td>
<td>0.34 0.04 9.47</td>
<td>0.30 0.04 7.30</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.12 0.02 6.50</td>
<td>0.12 0.02 6.38</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.05 0.01 3.47</td>
<td>0.05 0.01 3.89</td>
</tr>
<tr>
<td>SP15</td>
<td>1-2 Years</td>
<td>0.34 0.04 8.26</td>
<td>0.30 0.05 6.05</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.11 0.02 5.79</td>
<td>0.11 0.02 5.64</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.06 0.01 4.48</td>
<td>0.07 0.01 4.95</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
<th>R²</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coeff. Std. Err. t-stat</td>
<td>Coeff. Std. Err. t-stat</td>
<td>52% 52%</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>0.25 0.10 2.47</td>
<td>0.38 0.13 3.06</td>
<td>52% 52%</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>0.37 0.07 5.40</td>
<td>0.36 0.07 4.91</td>
<td>55% 55%</td>
</tr>
<tr>
<td>5-8 Years</td>
<td>(0.04) 0.05 (0.80)</td>
<td>(0.08) 0.05 (1.77)</td>
<td>56% 56%</td>
</tr>
</tbody>
</table>
Table V-C8. Pool by Hub Regressions With Spot Power Interacted

Hub Dummies for “After” Period

<table>
<thead>
<tr>
<th>Hub-specific Interacted Dummy on Spot Power</th>
<th>Time-to-Delivery Class</th>
<th>Ordinary Least Squares (OLS)</th>
<th>With Instrumental Variables (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coeff. Std. Err. t-stat</td>
<td>Coeff. Std. Err. t-stat</td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>1-2 Years</td>
<td>0.08  0.02  4.43</td>
<td>0.08  0.02  4.44</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.07  0.02  4.02</td>
<td>0.07  0.02  4.03</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.13  0.02  5.93</td>
<td>0.13  0.02  6.04</td>
</tr>
<tr>
<td>NP15</td>
<td>1-2 Years</td>
<td>0.10  0.02  5.44</td>
<td>0.10  0.02  5.45</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.09  0.02  5.48</td>
<td>0.10  0.02  5.46</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.15  0.02  7.15</td>
<td>0.16  0.02  7.29</td>
</tr>
<tr>
<td>PV</td>
<td>1-2 Years</td>
<td>0.10  0.02  5.91</td>
<td>0.10  0.02  5.92</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.10  0.02  5.90</td>
<td>0.10  0.02  5.89</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.15  0.02  6.99</td>
<td>0.15  0.02  7.10</td>
</tr>
<tr>
<td>SP15</td>
<td>1-2 Years</td>
<td>0.10  0.02  5.63</td>
<td>0.10  0.02  5.63</td>
</tr>
<tr>
<td></td>
<td>3-4 Years</td>
<td>0.09  0.02  5.50</td>
<td>0.10  0.02  5.48</td>
</tr>
<tr>
<td></td>
<td>5-8 Years</td>
<td>0.15  0.02  6.92</td>
<td>0.16  0.02  7.07</td>
</tr>
</tbody>
</table>

Gas Futures Estimates

<table>
<thead>
<tr>
<th>Time-to-Delivery Class</th>
<th>Ordinary Least Squares (OLS)</th>
<th>With Instrumental Variables (IV)</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff. Std. Err. t-stat</td>
<td>Coeff. Std. Err. t-stat</td>
<td>OLS IV Obs</td>
</tr>
<tr>
<td>1-2 Years</td>
<td>0.59  0.05  12.81</td>
<td>0.59  0.05  12.01</td>
<td>61% 60% 887</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>0.65  0.06  10.26</td>
<td>0.64  0.07  9.21</td>
<td>74% 73% 473</td>
</tr>
<tr>
<td>5-8 Years</td>
<td>0.30  0.08  3.69</td>
<td>0.23  0.09  2.58</td>
<td>63% 63% 226</td>
</tr>
</tbody>
</table>
“Pool by Class” Regressions

Here we aggregate the Mid-C and COB hubs and pool across all time-to-delivery classes. We run a separate regression for four aggregated hubs. The results of these regressions are summarized in Tables V-C9 and V-C10.

Table V-C9. Pool by Class Regression for “During” Period

<table>
<thead>
<tr>
<th>Hubs</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff.</td>
<td>Std. Err.</td>
<td>t-stat</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>0.62</td>
<td>0.15</td>
<td>4.19</td>
</tr>
<tr>
<td>NP15</td>
<td>1.35</td>
<td>0.16</td>
<td>8.41</td>
</tr>
<tr>
<td>PV</td>
<td>0.79</td>
<td>0.11</td>
<td>6.99</td>
</tr>
<tr>
<td>SP15</td>
<td>0.72</td>
<td>0.06</td>
<td>11.73</td>
</tr>
</tbody>
</table>

Table V-C10. Pool by Class Regression for “After” Period

<table>
<thead>
<tr>
<th>Hubs</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff.</td>
<td>Std. Err.</td>
<td>t-stat</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>0.54</td>
<td>0.08</td>
<td>7.09</td>
</tr>
<tr>
<td>NP15</td>
<td>0.68</td>
<td>0.04</td>
<td>18.58</td>
</tr>
<tr>
<td>PV</td>
<td>0.27</td>
<td>0.09</td>
<td>2.89</td>
</tr>
<tr>
<td>SP15</td>
<td>0.46</td>
<td>0.03</td>
<td>13.64</td>
</tr>
</tbody>
</table>

“Pool by Class and Hub” Regressions

We run a single regression by pooling across all time-to-delivery classes and hubs. The results of these regressions are summarized in Table V-C11.

Table V-C11. Pool by Class and Hub Regression Results

<table>
<thead>
<tr>
<th>Period</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff.</td>
<td>Std. Err.</td>
<td>t-stat</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;During&quot;</td>
<td>0.61</td>
<td>0.05</td>
<td>13.17</td>
</tr>
<tr>
<td>&quot;After&quot;</td>
<td>0.57</td>
<td>0.02</td>
<td>23.11</td>
</tr>
</tbody>
</table>
"No Aggregation" Regression

We run a separate regression for each disaggregated time-to-delivery class and hub. As illustrated in Tables V-C12 and V-C13, the results of these regressions are somewhat irregular due to an insignificant number of transactions in many time-to-delivery class and hub bins.

### Table V-C12. No Aggregation Regression for “During” Period

<table>
<thead>
<tr>
<th>Hubs</th>
<th>Time-to-Delivery Class</th>
<th>Gas Futures Estimates</th>
<th>Spot Power Estimates</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>COB</td>
<td>1 year</td>
<td>(7.01) 0.45 (15.62)</td>
<td>6.63 0.53 (12.57)</td>
<td>(0.65) 0.14 (4.74)</td>
</tr>
<tr>
<td></td>
<td>2 years</td>
<td>2.23 0.28 7.86</td>
<td>2.17 0.30 7.19</td>
<td>(0.24) 0.10 (2.33)</td>
</tr>
<tr>
<td></td>
<td>3 years</td>
<td>0.85 0.17 4.87</td>
<td>0.60 0.21 2.81</td>
<td>0.06 0.05 1.27</td>
</tr>
<tr>
<td></td>
<td>4 years</td>
<td>3.88 0.14 26.82</td>
<td>3.88 0.14 26.82</td>
<td>(0.39) 0.04 (9.63)</td>
</tr>
<tr>
<td></td>
<td>5 years</td>
<td>0.00 . . .</td>
<td>0.00 . . .</td>
<td>0.68 . . .</td>
</tr>
<tr>
<td></td>
<td>7 years</td>
<td>0.00 . . .</td>
<td>0.00 . . .</td>
<td>0.63 . . .</td>
</tr>
<tr>
<td>Mid-C</td>
<td>1 year</td>
<td>(18.86) 18.44 (1.02)</td>
<td>109.08 314.38 0.35</td>
<td>1.51 5.86 0.26</td>
</tr>
<tr>
<td></td>
<td>2 years</td>
<td>0.29 0.14 2.05</td>
<td>1.58 0.55 2.90</td>
<td>0.47 0.04 11.44</td>
</tr>
<tr>
<td></td>
<td>3 years</td>
<td>0.46 0.39 1.17</td>
<td>0.61 0.40 1.52</td>
<td>0.15 0.06 2.24</td>
</tr>
<tr>
<td></td>
<td>4 years</td>
<td>2.09 0.09 23.72</td>
<td>1.99 0.11 17.51</td>
<td>0.04 0.08 0.55</td>
</tr>
<tr>
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<td>5 years</td>
<td>0.62 0.19 3.25</td>
<td>0.62 0.19 3.25</td>
<td>0.00 0.04 (0.03)</td>
</tr>
<tr>
<td></td>
<td>6 years</td>
<td>0.00 . . .</td>
<td>0.00 . . .</td>
<td>0.68 0.00 737.17</td>
</tr>
<tr>
<td>NP15</td>
<td>1 year</td>
<td>2.33 . . .</td>
<td>2.33 . . .</td>
<td>(0.04) . . .</td>
</tr>
<tr>
<td></td>
<td>2 years</td>
<td>1.24 0.38 3.27</td>
<td>0.82 0.42 1.97</td>
<td>0.17 0.16 1.07</td>
</tr>
<tr>
<td></td>
<td>3 years</td>
<td>2.21 0.33 6.77</td>
<td>2.29 0.39 5.91</td>
<td>0.12 0.05 2.61</td>
</tr>
<tr>
<td></td>
<td>4 years</td>
<td>0.91 0.62 1.48</td>
<td>1.20 0.99 1.21</td>
<td>0.24 0.17 1.45</td>
</tr>
<tr>
<td></td>
<td>5 Years</td>
<td>(0.65) 0.13 (5.07)</td>
<td>(0.61) 0.13 (4.71)</td>
<td>(0.07) 0.03 2.43</td>
</tr>
<tr>
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<td>6 Years</td>
<td>2.52 . . .</td>
<td>2.52 . . .</td>
<td>0.00 . . .</td>
</tr>
<tr>
<td></td>
<td>7 years</td>
<td>0.52 0.00 .</td>
<td>0.52 0.00 .</td>
<td>(0.04) 0.00 .</td>
</tr>
<tr>
<td>PV</td>
<td>1 Year</td>
<td>(0.02) 0.90 (0.03)</td>
<td>(0.02) 0.90 (0.03)</td>
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</tr>
<tr>
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<td>2 Years</td>
<td>1.15 0.14 8.34</td>
<td>1.10 0.14 7.96</td>
<td>0.19 0.04 4.71</td>
</tr>
<tr>
<td></td>
<td>3 Years</td>
<td>0.46 0.22 2.09</td>
<td>0.58 0.22 2.59</td>
<td>0.09 0.06 1.53</td>
</tr>
<tr>
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<td>4 Years</td>
<td>0.19 0.15 1.25</td>
<td>0.19 0.15 1.28</td>
<td>0.11 0.04 2.44</td>
</tr>
<tr>
<td></td>
<td>5 Years</td>
<td>0.22 0.16 1.38</td>
<td>0.22 0.16 1.39</td>
<td>0.05 0.04 1.30</td>
</tr>
<tr>
<td></td>
<td>6 Years</td>
<td>0.03 0.06 0.54</td>
<td>0.03 0.06 0.53</td>
<td>0.10 0.02 6.13</td>
</tr>
<tr>
<td></td>
<td>7 Years</td>
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<td>0.79 0.56 1.40</td>
<td>(0.22) 0.22 (0.99)</td>
</tr>
<tr>
<td>SP15</td>
<td>1 Year</td>
<td>(0.69) 0.38 (1.82)</td>
<td>(0.63) 0.75 (0.83)</td>
<td>0.34 0.19 1.82</td>
</tr>
<tr>
<td></td>
<td>2 Years</td>
<td>0.72 0.12 6.21</td>
<td>0.84 0.13 6.55</td>
<td>0.17 0.05 3.30</td>
</tr>
<tr>
<td></td>
<td>3 Years</td>
<td>0.22 0.14 1.59</td>
<td>0.27 0.14 1.93</td>
<td>0.07 0.04 1.58</td>
</tr>
<tr>
<td></td>
<td>4 Years</td>
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<td>0.89 0.21 4.21</td>
<td>0.14 0.04 3.84</td>
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<td>5 Years</td>
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<td>0.04 0.03 1.51</td>
</tr>
<tr>
<td></td>
<td>6 Years</td>
<td>(0.10) 0.83 (0.11)</td>
<td>(0.44) 0.85 (0.52)</td>
<td>0.16 0.11 1.47</td>
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<td>0.76 0.57 1.34</td>
<td>0.76 0.57 1.34</td>
<td>(0.05) 0.07 (0.84)</td>
</tr>
<tr>
<td>Time-to-Delivery</td>
<td>Gas Futures Estimates</td>
<td>Spot Power Estimates</td>
<td>R²</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------</td>
<td>----------------------</td>
<td>----</td>
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</tr>
<tr>
<td>Hubs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COB</td>
<td>(0.48) 0.67 (0.71)</td>
<td>(0.48) 0.67 (0.71)</td>
<td>1.19 0.22 5.51</td>
<td>1.19 0.22 5.51</td>
</tr>
<tr>
<td>1 Year</td>
<td>1.84 0.23 7.98</td>
<td>1.84 0.23 7.98</td>
<td>(0.50) 0.07 (7.05)</td>
<td>(0.50) 0.07 (7.05)</td>
</tr>
<tr>
<td>2 Years</td>
<td>0.45 0.04 10.09</td>
<td>0.45 0.04 10.09</td>
<td>0.79 0.02 49.53</td>
<td>0.79 0.02 49.53</td>
</tr>
<tr>
<td>3 Years</td>
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<td>0.00 . . .</td>
<td>1.19 0.00 4,222.98</td>
<td>1.19 0.00 4,222.98</td>
</tr>
<tr>
<td>6 Years</td>
<td>0.00 . . .</td>
<td>0.00 . . .</td>
<td>0.88 . . .</td>
<td>0.88 . . .</td>
</tr>
<tr>
<td>7 Years</td>
<td>(0.38) 0.52 (0.73)</td>
<td>(0.39) 0.52 (0.74)</td>
<td>(0.21) 0.10 (2.08)</td>
<td>(0.21) 0.10 (2.08)</td>
</tr>
<tr>
<td>2 Years</td>
<td>0.93 0.23 4.00</td>
<td>0.67 0.24 2.76</td>
<td>0.03 0.07 0.48</td>
<td>0.07 0.07 1.06</td>
</tr>
<tr>
<td>3 Years</td>
<td>0.33 0.41 0.80</td>
<td>0.43 0.42 1.03</td>
<td>0.35 0.26 1.36</td>
<td>0.36 0.26 1.38</td>
</tr>
<tr>
<td>Mid-C</td>
<td>1.15 0.37 3.14</td>
<td>1.13 0.38 2.98</td>
<td>0.11 0.19 0.57</td>
<td>0.11 0.19 0.60</td>
</tr>
<tr>
<td>4 Years</td>
<td>(0.11) 0.40 (0.27)</td>
<td>(0.11) 0.40 (0.27)</td>
<td>0.48 0.25 1.93</td>
<td>0.48 0.25 1.93</td>
</tr>
<tr>
<td>5 Years</td>
<td>0.00 . . .</td>
<td>0.00 . . .</td>
<td>1.16 . . .</td>
<td>1.16 . . .</td>
</tr>
<tr>
<td>6 Years</td>
<td>3.56 1.33 2.68</td>
<td>3.56 1.33 2.69</td>
<td>0.87 0.32 2.73</td>
<td>0.87 0.32 2.73</td>
</tr>
<tr>
<td>7 Years</td>
<td>0.36 0.17 2.08</td>
<td>0.36 0.18 2.04</td>
<td>(0.01) 0.08 (0.07)</td>
<td>(0.01) 0.08 (0.07)</td>
</tr>
<tr>
<td>2 Years</td>
<td>0.88 0.07 12.32</td>
<td>0.81 0.07 11.14</td>
<td>0.05 0.03 2.07</td>
<td>0.06 0.03 2.55</td>
</tr>
<tr>
<td>3 Years</td>
<td>0.81 0.11 7.47</td>
<td>0.84 0.12 6.92</td>
<td>0.02 0.02 0.93</td>
<td>0.02 0.02 0.78</td>
</tr>
<tr>
<td>NP15</td>
<td>0.79 0.22 3.53</td>
<td>0.60 0.24 2.52</td>
<td>0.00 0.06 0.00</td>
<td>0.02 0.06 0.37</td>
</tr>
<tr>
<td>4 Years</td>
<td>0.39 0.16 2.48</td>
<td>0.28 0.16 1.76</td>
<td>0.00 0.04 0.06</td>
<td>0.02 0.04 0.40</td>
</tr>
<tr>
<td>5 Years</td>
<td>0.18 0.08 2.26</td>
<td>0.19 0.08 2.24</td>
<td>(0.07) 0.01 (4.59)</td>
<td>(0.07) 0.01 (4.59)</td>
</tr>
<tr>
<td>6 Years</td>
<td>(0.21) 0.36 (0.59)</td>
<td>(0.29) 0.36 (0.80)</td>
<td>0.01 0.17 0.09</td>
<td>0.01 0.17 0.07</td>
</tr>
<tr>
<td>7 Years</td>
<td>0.39 6.38 0.06</td>
<td>1.35 6.58 0.20</td>
<td>0.56 1.36 0.41</td>
<td>0.32 1.38 (0.23)</td>
</tr>
<tr>
<td>2 Years</td>
<td>0.78 0.09 8.32</td>
<td>0.77 0.09 8.28</td>
<td>0.06 0.03 2.20</td>
<td>0.06 0.03 2.21</td>
</tr>
<tr>
<td>3 Years</td>
<td>1.07 0.31 3.46</td>
<td>1.00 0.31 3.20</td>
<td>0.01 0.06 (0.10)</td>
<td>0.00 0.06 (0.01)</td>
</tr>
<tr>
<td>PV</td>
<td>0.52 0.23 2.24</td>
<td>0.52 0.23 2.21</td>
<td>0.04 0.08 0.56</td>
<td>0.04 0.08 0.57</td>
</tr>
<tr>
<td>4 Years</td>
<td>0.21 0.39 0.56</td>
<td>0.22 0.39 0.56</td>
<td>0.14 0.08 1.68</td>
<td>0.14 0.08 1.66</td>
</tr>
<tr>
<td>5 Years</td>
<td>0.68 0.48 1.41</td>
<td>0.67 0.48 1.41</td>
<td>0.00 0.18 0.01</td>
<td>0.00 0.18 0.01</td>
</tr>
<tr>
<td>6 Years</td>
<td>(0.17) 0.44 (0.39)</td>
<td>(0.32) 0.45 (0.72)</td>
<td>0.02 0.12 0.19</td>
<td>0.04 0.12 0.33</td>
</tr>
<tr>
<td>7 Years</td>
<td>0.76 0.52 1.46</td>
<td>0.29 0.66 0.44</td>
<td>0.18 0.20 0.92</td>
<td>0.32 0.23 1.38</td>
</tr>
<tr>
<td>2 Years</td>
<td>0.70 0.04 16.20</td>
<td>0.79 0.05 16.66</td>
<td>0.04 0.02 2.82</td>
<td>0.03 0.02 1.63</td>
</tr>
<tr>
<td>3 Years</td>
<td>0.74 0.12 6.13</td>
<td>0.72 0.12 5.81</td>
<td>0.08 0.03 2.63</td>
<td>0.08 0.03 2.68</td>
</tr>
<tr>
<td>SP15</td>
<td>0.50 0.19 2.68</td>
<td>0.51 0.19 2.75</td>
<td>0.12 0.04 3.12</td>
<td>0.12 0.04 3.08</td>
</tr>
<tr>
<td>4 Years</td>
<td>0.71 0.27 2.61</td>
<td>0.71 0.27 2.61</td>
<td>0.07 0.06 1.15</td>
<td>0.07 0.06 1.15</td>
</tr>
<tr>
<td>5 Years</td>
<td>1.30 1.17 1.11</td>
<td>1.30 1.17 1.11</td>
<td>0.16 0.08 1.96</td>
<td>0.16 0.08 1.96</td>
</tr>
<tr>
<td>6 Years</td>
<td>(0.58) 0.12 (4.96)</td>
<td>(0.58) 0.12 (4.96)</td>
<td>0.38 0.03 10.91</td>
<td>0.38 0.03 10.91</td>
</tr>
</tbody>
</table>
Appendix V-D: Serial Correlation

Our statistical model attempts to capture the main determinants of forward power prices. Inference based on standard OLS or IV coefficient estimates and standard errors assumes that there is no systematic variation in the portion of the dependent variable, in this case the price of forward power, that is not explained by the statistical model (i.e., the error). Serial correlation occurs when the errors in the estimates are not independent. In the presence of serial correlation, standard errors from conventional OLS and IV estimation tend to be understated and, therefore, claims of statistical significance of model coefficients tend to be overstated.¹

To test the sensitivity of our regression results to the potential presence of serial correlation, we re-estimated one model specification using techniques that produce standard errors that explicitly account for the presence of serial correlation. Because our data are organized as an unbalanced panel (i.e., we have contracts signed at irregularly spaced points in time for different delivery periods and locations), correcting for serial correlation could be computationally intensive. We have chosen a method that requires minimal amounts of computation but requires some aggregation of the underlying data. We perform a panel version of Prais-Winsten estimation² and treat each combination of hub and time-to-delivery as a subpanel.³ Within each subpanel, multiple contracts signed on the same day are averaged. The Prais-Winsten estimation is performed on these aggregated data. We constrain the extent of serial correlation to be equal across subpanels. The results are shown in Table V-D1 below. The table also shows OLS results on the aggregated data for comparison with our OLS results on the disaggregated data.⁴

³Our estimation is performed using Stata’s “xtsce” command. See the Stata, version 7 manuals for the details of this command.
⁴The OLS parameter estimates for the disaggregated data match the estimates in Table V-3, but the standard errors are slightly different. The parameter estimates in Table V-D1 are the result of a single stacked regression rather than four separate hub-specific regressions. In this particular stacked regression, we constrain our estimate of the error variance to be equal across hubs. This constraint affects estimated standard errors but not parameter estimates.
### Table V-D1. Prais-Winsten Estimates of the Spot Power Coefficient

<table>
<thead>
<tr>
<th>Hubs</th>
<th>Time-to-Delivery Class</th>
<th>Coefficient on log spot power</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Disaggregated Data</td>
<td>Aggregated Data</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OLS (stacked)</td>
<td>OLS (stacked)</td>
<td></td>
</tr>
<tr>
<td>Mid-C/COB</td>
<td>1 Year</td>
<td>0.375</td>
<td>0.053</td>
<td>0.364</td>
</tr>
<tr>
<td></td>
<td>2 Years</td>
<td>0.135</td>
<td>0.076</td>
<td>0.163</td>
</tr>
<tr>
<td></td>
<td>3 Years</td>
<td>-0.004</td>
<td>0.131</td>
<td>-0.016</td>
</tr>
<tr>
<td>NP15</td>
<td>1 Year</td>
<td>0.219</td>
<td>0.129</td>
<td>0.227</td>
</tr>
<tr>
<td></td>
<td>2 Years</td>
<td>0.141</td>
<td>0.091</td>
<td>0.112</td>
</tr>
<tr>
<td></td>
<td>3 Years</td>
<td>0.063</td>
<td>0.132</td>
<td>0.057</td>
</tr>
<tr>
<td>PV</td>
<td>1 Year</td>
<td>0.383</td>
<td>0.045</td>
<td>0.314</td>
</tr>
<tr>
<td></td>
<td>2 Years</td>
<td>0.088</td>
<td>0.045</td>
<td>0.079</td>
</tr>
<tr>
<td></td>
<td>3 Years</td>
<td>0.070</td>
<td>0.059</td>
<td>0.066</td>
</tr>
<tr>
<td>SP15</td>
<td>1 Year</td>
<td>0.232</td>
<td>0.066</td>
<td>0.207</td>
</tr>
<tr>
<td></td>
<td>2 Years</td>
<td>0.072</td>
<td>0.044</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>3 Years</td>
<td>0.037</td>
<td>0.065</td>
<td>0.043</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>1066</td>
<td></td>
<td>598</td>
</tr>
<tr>
<td>rho</td>
<td></td>
<td></td>
<td></td>
<td>598</td>
</tr>
</tbody>
</table>

Neither aggregation nor controlling for serial correlation produces qualitatively different results. That is, the coefficients do not differ between the OLS disaggregated case and the OLS aggregated case, nor between the OLS aggregated case and the Prais-Winsten case. The standard errors in the OLS aggregated case and the Prais-Winsten case are also similar. This last result shows that serial correlation does not affect the precision of our estimates. In part, this is because the estimated degree of serial correlation, labeled “rho” in Table V-D1, is modest. In addition, there are significant gaps in the data. Successive transactions with the same delivery location and time to delivery may be several days apart. Even if serial correlation is present, if trades are spaced far enough apart in time, it may not matter.\(^5\)

\(^5\)Serial correlation is a more serious issue for similar analyses based on daily index prices. See Harvey and Hogan, *op. cit.*, note 2.
Appendix IX-A: A Detailed Description of Trader 1’s Trading Positions and Profits for the June 14, 2001 Market Test

This appendix describes trading of NYMEX look-alike swaps on EOL on June 14, 2001 by one trader. As described in detail in Chapter III, one of the most common OTC derivative products is known as the OTC swap or the NYMEX look-alike swap. This swap derives its value from the price of the NYMEX natural gas futures contract. Henry Hub physical transactions strongly correlate with the NYMEX futures and the related OTC NYMEX look-alike swaps because the NYMEX futures directly settle based on the Henry Hub physical delivery price.

Following the run-up in prices in the next-day physical market from 10:12 a.m. through 10:35 a.m., trader 1 of the Central desk entered short transactions in July delivery OTC swaps through four sales of 15,000 MMBtu swaps at 4.095, 4.09, 4.085, and 4.09, respectively (where the four average $4.09). The total volume amounted to 60,000 MMBtu in July delivery OTC swaps. That is, the trader promised to sell 60,000 MMBtu of gas every day for the next month (July) at an average price of $4.09/MMBtu. If the NYMEX price for the July gas on a given day in June is more that $4.09, then the trader has incurred losses for that day because he is selling gas (whether he actually has the gas or needs to buy it) at a price below the market value. Conversely, if the price is below $4.09, then his position is profitable because he is selling gas for more than the market value.

Recall that this manipulation involved first selling slowly into the market and then repurchasing quickly. The strategy did not involve additional downward pressure in the physical market at the end of the manipulation as was displayed in the July 19 manipulation. In that manipulation, Staff allocated the opening short position as a vehicle to profit from the manipulation due to Enron’s apparent intent to push the market down further. The data reflected this intent where they showed Enron was a net seller of Henry Hub next-day physical gas for the day. This was also supported by depositional testimony.

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1Data reflect that the Enron trader was net short OTC swaps prior to the beginning of the day. However, because the market first rose and then fell back to the approximate opening price, Staff only allocated the financial trades that occurred during the physical manipulation as vehicles potentially purchased to profit by the manipulation.
These swaps have a term of 31 days and the quoted volume is a daily volume; therefore, 60,000 multiplied by 31 days yields an intraday short position of 1,860,000 MMBtu. Trader 1 then increased the short position by the additional sale of another 15,000 MMBtu/d (for a total of 465,000 MMBtu) at the price of $4.045/MMBtu at 11:24 a.m., resulting in a total increase of his intraday short position to 75,000 MMBtu/d (for a total of 2,325,000 MMBtu) and an average sell price of $4.081. In essence, the trader has promised to sell 75,000 MMBtu of gas for every day of July at an average price of $4.081.

Between 2:19 and 2:20 p.m., after the market test ceased, trader 1 reduced his net short position by buying 25,000 MMBtu/d at $4.05. Here, the trader has promised to purchase 25,000 MMBtu of gas for each day in July at a price of $4.05. If the NYMEX price for July gas on a given day in June is above $4.05, the trader earns a profit because he is buying gas below market value. If the price is below $4.05, he is incurring a loss because he is buying gas above market price. This purchase is used to meet and close out 25,000 MMBtu of his promise to sell. Since the trader bought at $.031 less than his obligation to sell, he generates a profit of $24,025.2

Trader 1 then further reduced his short position by 30,000 MMBtu/d. He bought the 30,000 MMBtu/d at an average price of $4.0883, generating a loss of $6,820 on this portion of his position or a net gain of only $17,205. He is effectively buying the gas at $4.0883 for every day of July to fulfill his promise to sell the gas at $4.081, generating a loss of $.0073/MMBtu for each of the 31 days in July.

Trader 1 retained the remaining 20,000 MMBtu/d of his short position until the end of trading, when the market closed at $4.02. This generated additional profits of $37,820. He now has a promise to sell 20,000 MMBtu of gas for each day of July at a price of $4.081 and can meet that obligation by purchasing gas at a market value of $4.02, generating a profit of $37,820.

Trader 1’s total profit arising from the market test amounted to $55,025.

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2Trader 1 sold at an average price of $4.081 and bought at an average price of $4.05, yielding a profit of 3.1 cents/MMBtu ($0.031 multiplied by 25,000 MMBtu/d and then multiplied by 31 days in the contract yields a profit of $24,025).