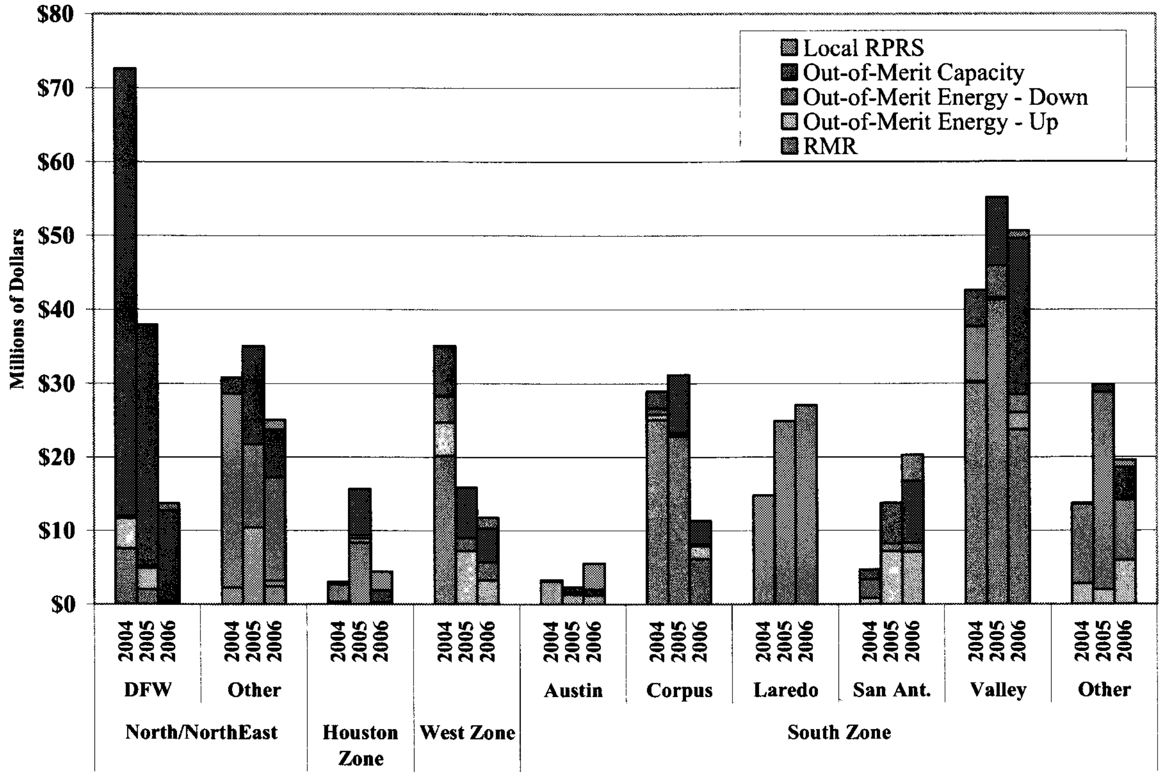
Figure 66: Expenses for OOME, OOMC and RMR by Region 2004 – 2006



Uplift costs decreased dramatically from 2004 to 2006 in the Dallas/Ft. Worth ("DFW") area, in the West zone and in the South zone Corpus Christi area. In DFW, the reduction was due to less frequent OOMC commitments, whereas uplift was reduced in the West zone by the elimination of RMR status for units located in that area. Corpus Christi area uplift cost reduction was primarily caused by the decrease of RMR payments, from $23 million in 2005 to $6 million in 2006. RMR costs in the Laredo area increased from 2004 to 2006 due to increased fuel costs, as the number of RMR units in that area remained constant during this time period. The most significant increases in uplift costs associated with local reliability actions from 2004 to 2006 was in the San Antonio area, increasing fourfold from around $5 million in 2004 to approximately $20 million in 2006.

V. ANALYSIS OF COMPETITIVE PERFORMANCE

In this section, we evaluate competition in the ERCOT market by analyzing the market structure and the conduct of the participants during 2006. We examine market structure using a pivotal supplier analysis, which indicates that suppliers were pivotal in the balancing energy market at a significantly smaller frequency in 2006 than in 2005. This analysis also shows that the frequency with which a supplier was pivotal increased with the level of demand. To evaluate participant conduct, we estimate measures of physical and economic withholding. We examine withholding patterns relative to the level of demand and the size of each supplier's portfolio. Based on theses analyses, we find that the overall competitive performance of the market was improved in 2006 relative to 2005.

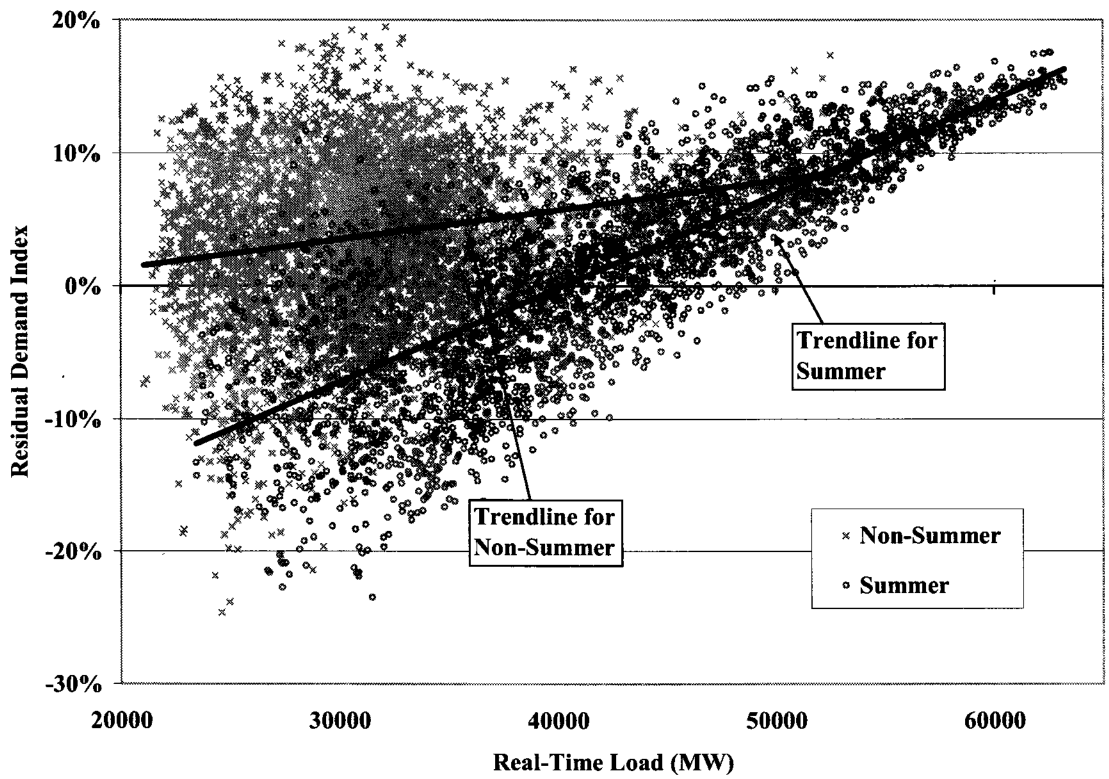
A. Structural Market Power Indicators

We analyze market structure using the Residual Demand Index ("RDI"), a statistic that measures the percentage of load that could not be satisfied without the resources of the largest supplier. When the RDI is greater than zero, the largest supplier is pivotal (*i.e.*, its resources are needed to satisfy the market demand). When the RDI is less than zero, no single supplier's resources are required in order to serve the load as long as the resources of its competitors are available.

The RDI is a useful structural indicator of potential market power, although it is important to recognize its limitations. As a structural indicator, it does not illuminate actual supplier behavior, indicating whether a supplier may have exercised market power. The RDI also does not indicate whether it would be profitable for a pivotal supplier to exercise market power. However, it does identify conditions under which a supplier would have the *ability* to raise prices significantly by withholding resources.

Figure 67 shows the RDI relative to load on an hourly basis in 2006. The data is divided into two groups: (i) hours during the summer months (from May to September) are shown using darker points, while (ii) hours during other months are shown using lighter points. The trend lines for each data series are also shown and indicate a strong positive relationship between load and the RDI. This analysis is done at the QSE level because the largest suppliers that determine the RDI values shown below own a large majority of the resources they are scheduling or offering. It is possible that they also control the remaining capacity through bilateral arrangements, although we do not know whether this is the case. To the extent that the resources scheduled by the largest QSEs are not controlled or providing revenue to the QSE, the RDIs will tend to be slightly overstated.

Figure 67: Residual Demand Index 2006



The figure shows that the RDI for the summer (i.e. May to September) was usually positive in hours when load exceeded 40,000 MW. During the summer, the RDI was greater than zero in approximately 58 percent of hours. During the non-summer period, the RDI was generally positive under all load conditions. The RDI was typically positive at lower load levels during the spring and fall due to the large number of generation planned outages and less commitment. Hence, although the load was lower outside the summer, our analysis shows that a QSE was pivotal in approximately 75 percent of hours during that period. In addition to being higher on average, the non-summer trend line exhibits a flatter slope than the trend line for the summer period. The flatter slope of the non-summer trend line indicates a weaker relationship between the RDI and demand level in the non-summer months. It is important to recognize that

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inferences regarding market power cannot be made solely from this data. Retail load obligations can affect the extent of market power for large suppliers, since such obligations cause them to be much smaller net sellers into the wholesale market than the analysis above would indicate. Bilateral contract obligations can also affect a supplier's potential market power. For example, a smaller supplier selling energy in the balancing energy market and through short-term bilateral contracts may have a much greater incentive to exercise market power than a larger supplier with substantial long-term sales contracts. The RDI measure shown in the previous figure does not consider the contractual position of the supplier, which can increase a supplier's incentive to exercise market power compared to the load-adjusted capacity assumption made in this analysis.

In addition, a supplier's ability to exercise market power in the current ERCOT balancing energy market may be higher than indicated by the standard RDI. Hence, a supplier may be pivotal in the balancing energy market when it would not have been pivotal according to the standard RDI shown above. To account for this, we developed RDI statistics for the balancing energy market. Figure 68 shows the RDI in the balancing energy market relative to the actual load level.

Ordinarily, the RDI is used to measure the percentage of load that cannot be served without the resources of the largest supplier, assuming that the market could call upon all committed and quick-start capacity[35] owned by other suppliers. Figure 68 limits the other supplier's capacity to the capacity offered in the balancing energy market. When the RDI is greater than zero, the largest supplier's balancing energy offers are necessary to prevent a shortage of offers in the balancing energy market. Figure 69 shows the same data as in Figure 68 except that the balancing energy offers are limited by portfolio ramp constraints in each interval.

35 For the purpose of this analysis, "quick-start" includes off-line simple cycle gas turbines that are flagged as on-line in the resource plan with a planned generation level of 0 MW that ERCOT has identified as capable of starting-up and reaching full output after receiving a deployment instruction from the balancing energy market.

Figure 68: Balancing Energy Market RDI vs. Actual Load 2006

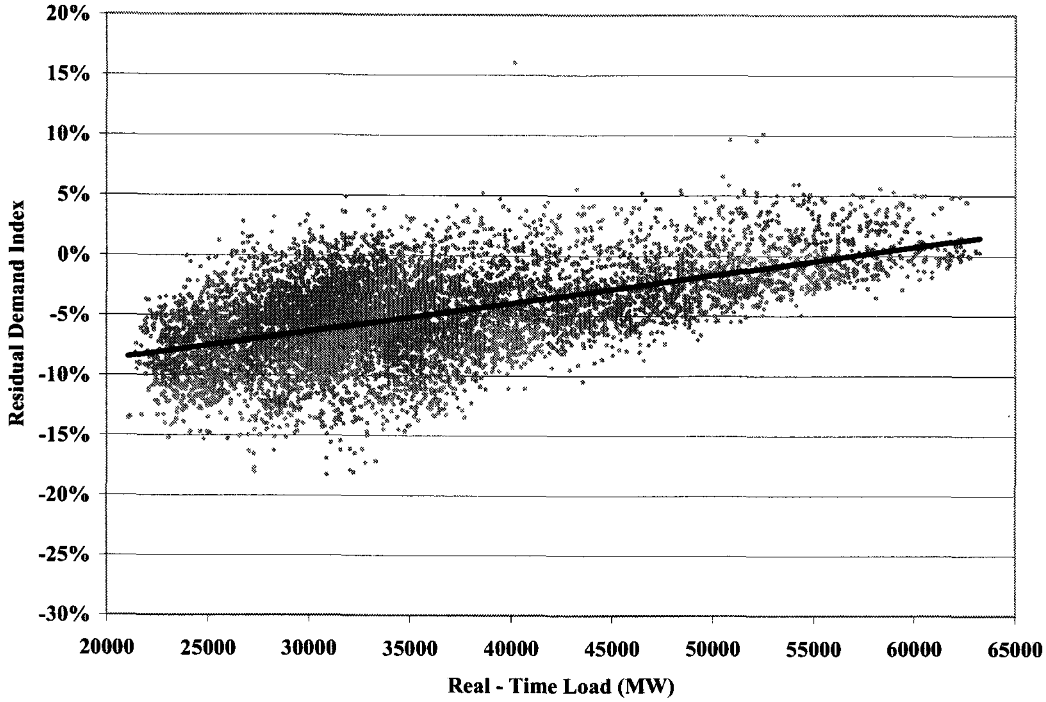
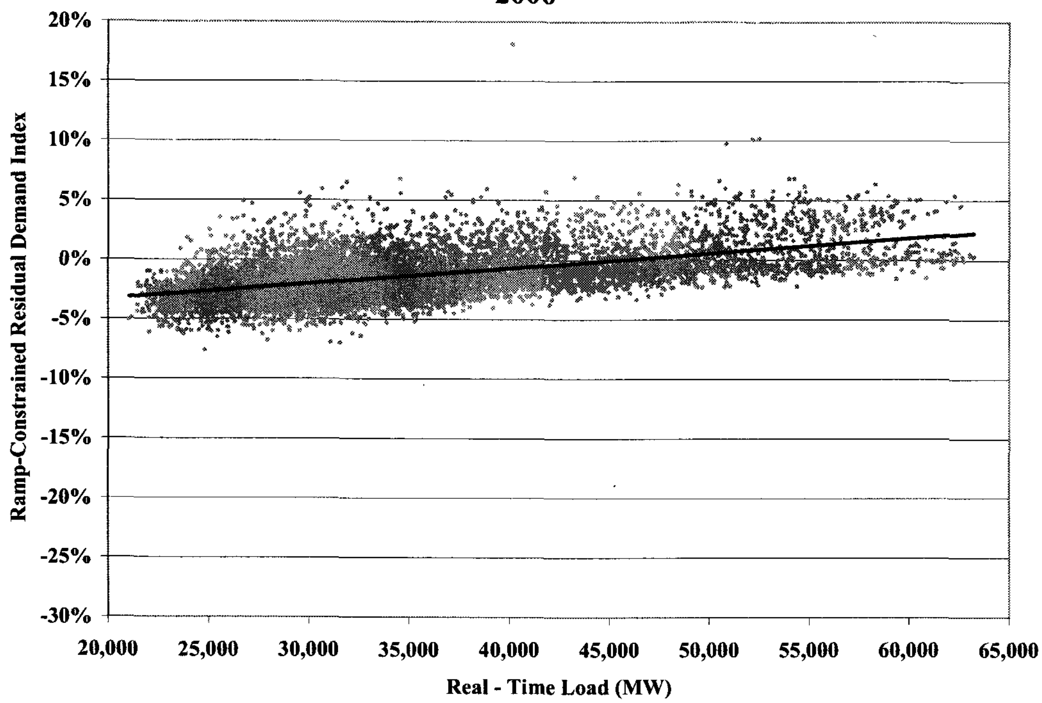
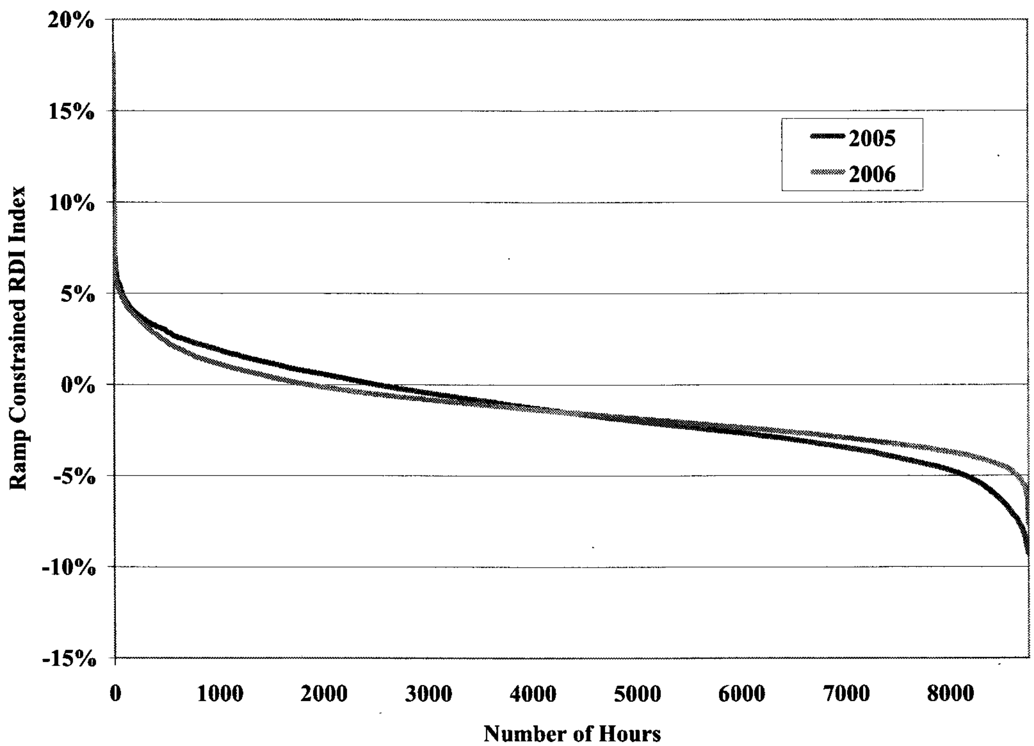


Figure 69: Ramp-Constrained Balancing Energy Market RDI vs. Actual Load 2006



In 2006, the instances when the RDI was positive occurred over a wide range of load levels, from 25 GW to 63 GW. The RDI results for the balancing energy market shown in the preceding two figures help explain how transient price spikes can occur under mild demand while large amounts of capacity are available in ERCOT. The balancing energy market RDI data and trend line for 2006 are similar in shape to 2005, although the frequency of data points that are positive is significantly lower in 2006 than in 2005. This difference is highlighted in Figure 70 which compares the balancing energy market RDI duration curves for 2005 and 2006.

Figure 70: Ramp-Constrained Balancing Energy Market RDI Duration Curve 2005 & 2006



In 2006, there were 1,861 hours (21.2 percent) when the balancing energy market RDI was greater than zero, which means a supplier was pivotal in the balancing energy market 21.2 percent of the time in 2006. In contrast, there were 2,525 hours (28.8 percent) when the balancing energy market RDI was positive in 2005. Hence, the frequency with which a supplier was pivotal in the balancing energy market decreased 26 percent in 2006 indicating that the overall competitiveness of the balancing energy market improved in 2006. Among other factors, this decrease can be attributed to an average reduction in up balancing energy deployments in 2006, which was influenced by the existence of the under-scheduled charges associated with the

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replacement reserve market. Figure 71 examines how the balancing energy market RDIs are correlated with balancing energy market prices as adjusted for gas prices in 2006, and Figure 72 shows the same data for 2005.

Figure 71: Ramp-Constrained Balancing Energy Market RDI vs. Balancing Energy Price Adjusted for Fuel Price 2006

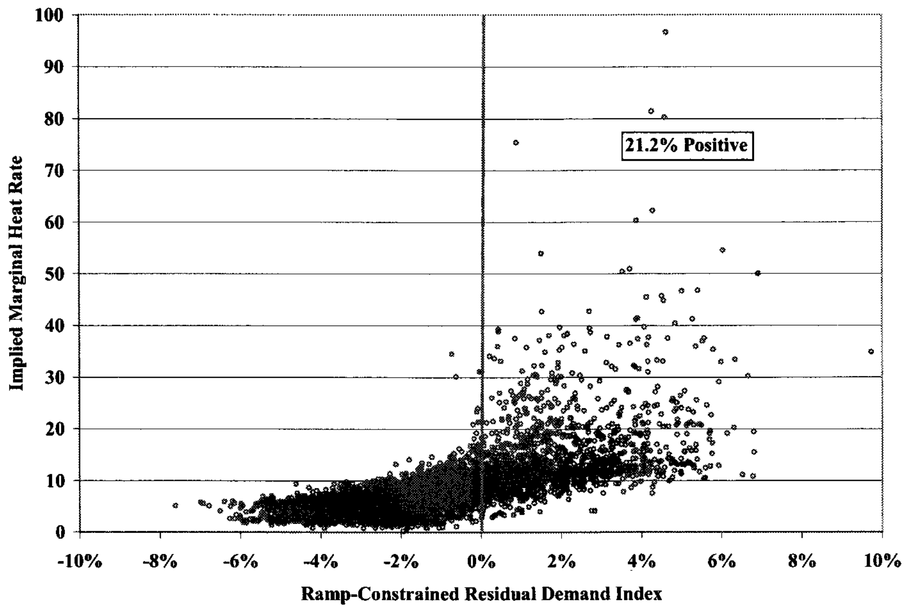
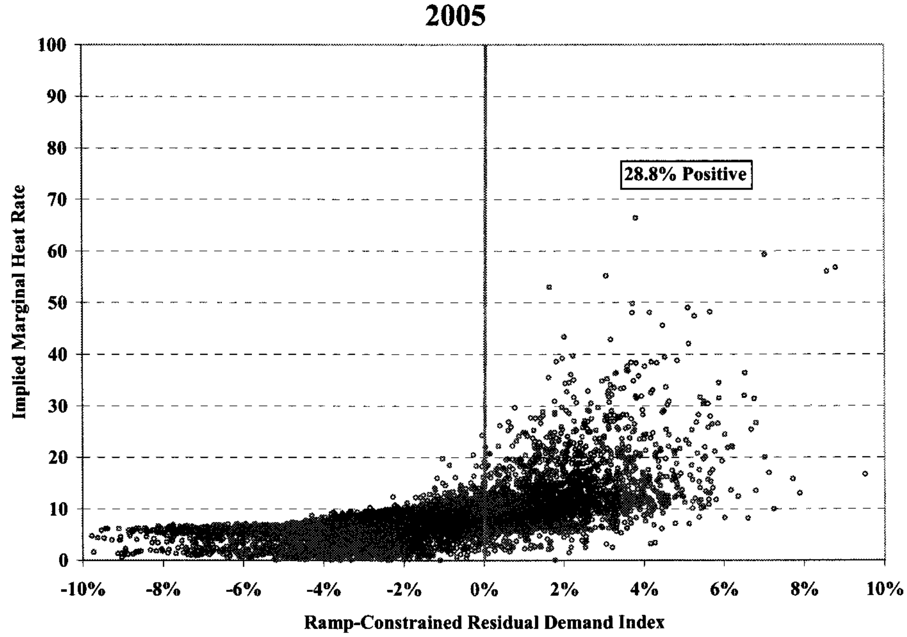


Figure 72: Ramp-Constrained Balancing Energy Market RDI vs. Balancing Energy Price Adjusted for Fuel Price 2005



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The figures above show a similar relationship between the ramp-constrained balancing energy market RDI and the gas price-adjusted balancing energy market price in 2005 and 2006, with the rate of change becoming exponentially larger as the balancing energy market RDI enters the positive range. However, Figure 70 reveals that the number of data points with positive ramp-constrained balancing energy market RDIs is over 26 percent less in 2006 than in 2005.

B. Evaluation of Supplier Conduct

The previous sub-section presented a structural analysis that supports inferences about potential market power. In this section we evaluate actual participant conduct to assess whether market participants have attempted to exercise market power through physical and economic withholding. In particular, we examined unit deratings and forced outages to detect physical withholding and we evaluate the "output gap" to detect economic withholding.

In a single-price auction like the balancing energy market auction, suppliers may attempt to exercise market power by withholding resources. The purpose of withholding is to cause more expensive resources to set higher market clearing prices, allowing the supplier to profit on its other sales in the balancing energy market. Because forward prices will generally be highly correlated with spot prices, price increases in the balancing energy market can also increase a supplier's profits in the bilateral energy market. The strategy is profitable when the withholding firm's incremental profit is greater than the lost profit from the foregone sales of its withheld capacity.

1. Evaluation of Potential Physical Withholding

Physical withholding occurs when a participant makes resources unavailable for dispatch that are otherwise physically capable of providing energy and that are economic at prevailing market prices. This can be done by derating a unit or designating it as a forced outage. In any electricity market, deratings and forced outages are unavoidable. The goal of the analysis in this section is to differentiate justifiable deratings and outages from physical withholding. We test for physical withholding by examining deratings and forced outage data to ascertain whether the data is correlated with conditions under which physical withholding would likely be most profitable.

The RDI results shown in Figure 67 through Figure 72 indicate that the potential for market power abuses rises as load rises and RDI values become more positive. Hence, if physical withholding is a problem in ERCOT, we would expect to see increased deratings and forced outages at the highest load levels. Conversely, because competitive prices increase as load increases, deratings and forced outages in a market performing competitively will tend to decrease as load approaches peak levels. Suppliers that lack market power will take actions to maximize the availability of their resources since their output is generally most profitable in these peak periods.

Figure 73 shows the average relationship of short-term deratings and forced outages as a percentage of total installed capacity to real-time load level during the summer months for large and small suppliers. Portfolio size is important in determining whether individual suppliers have incentives to withhold available resources. Hence, the patterns of outages and deratings of large suppliers can be usefully evaluated by comparing them to the small suppliers' patterns.

We focus on the summer months to eliminate the effects of planned outages and other discretionary deratings that occur in off-peak periods. Long-term deratings are not included in this analysis because they are unlikely to constitute physical withholding given the cost of such withholding. Renewable and cogeneration resources are also excluded from this analysis given the high variation in the availability of these classes of resources. The large supplier category includes the four largest suppliers in ERCOT, whereas the small supplier category includes the remaining suppliers (as long as the supplier controls at least 300 MW of capacity).

Figure 73: Short-Term Deratings by Load Level and Participant Size June to August, 2006

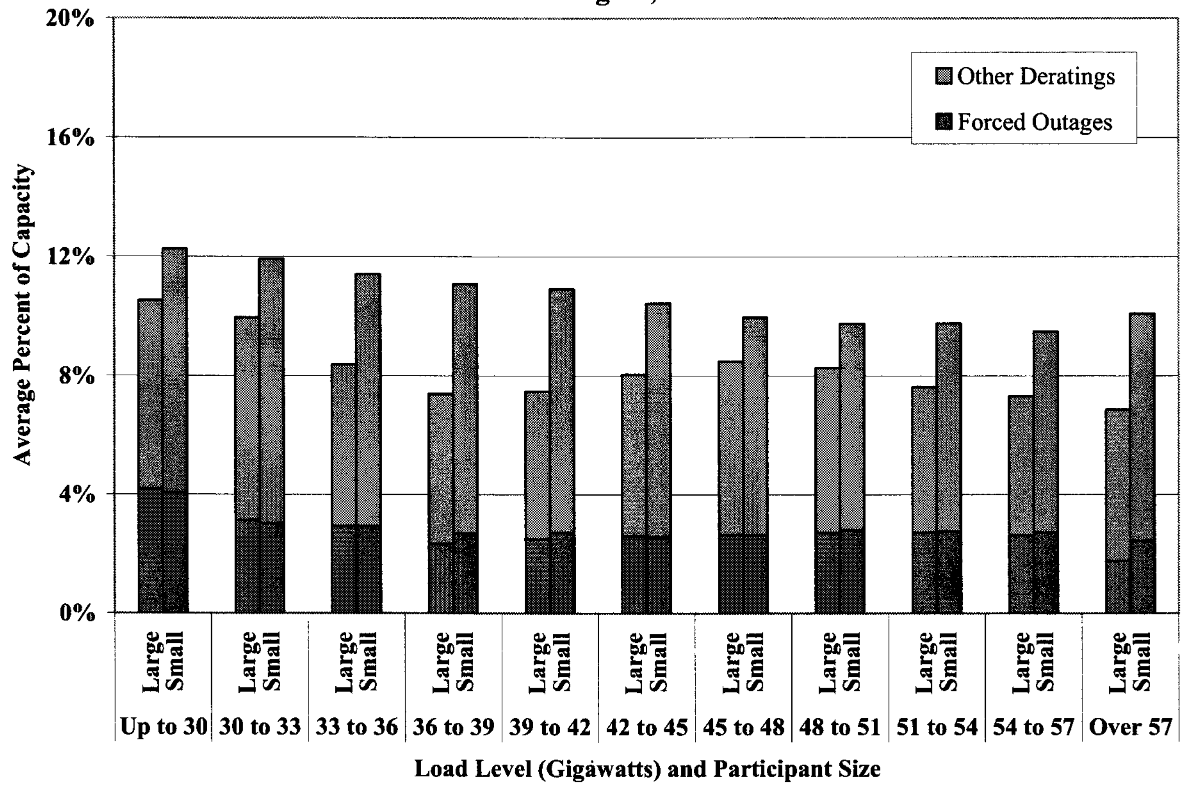

Figure 73 suggests that as electricity demand increases, both large and small market participants tend to make more capacity available to the market. For large and small suppliers, the short-term derating or forced outage rates decreased from approximately 11 to 12 percent at low demand levels to about 7 to 10 percent at load levels above 51 GW.

Large suppliers have derating rates that are lower than those of small suppliers across the range of load levels. Furthermore, large suppliers' deratings and outages generally decline as load levels increase. Given that the market is more vulnerable to market power at the highest load levels, these derating patterns do not provide evidence of physical withholding by the large suppliers. Although these data do not provide evidence of physical withholding by the large suppliers, the average derating rates for large and small suppliers are approximately 2 and 5 percent higher, respectively, than in 2005 at load levels greater than 51 GW. One possible explanation for this is the heightened awareness and importance that has been placed on the submission and updating of accurate resource plans following the rolling blackouts in April 2006

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which may result in QSEs more accurately reflecting the physical unit capabilities in the resource plans that they submit to ERCOT.

2. Evaluation of Potential Economic Withholding

To complement the prior analysis of physical withholding, this subsection evaluates potential economic withholding by calculating an "output gap". The output gap is defined as the quantity of energy that is not being produced by in-service capacity even though the in-service capacity is economic by a substantial margin given the balancing energy price. A participant can economically withhold resources, as measured by the output gap, by raising the balancing energy offers so as not to be dispatched (including both balancing up and balancing down offers) or by not offering unscheduled energy in the balancing energy market.

Resources can be included in the output gap when they are committed and producing at less than full output or when they are uncommitted and producing no energy. Unscheduled energy from committed resources is included in the output gap if the balancing energy price exceeds the marginal production cost of the energy by at least $50 per MWh. The output gap excludes capacity that is necessary for the QSE to fulfill its ancillary services obligations. Uncommitted capacity is considered to be in the output gap if the unit would have been profitable given published zonal day-ahead bilateral market prices.[36] The resource is counted in the output gap for commitment if its net revenue (market revenues less total cost, which includes startup and operating costs) exceeds the total cost of committing and operating the resource by a margin of at least 25 percent for the standard 16 hour delivery time associated with on-peak bilateral contracts.[37]

As was the case for outages and deratings, the output gap will frequently detect conduct that can be competitively justified. Hence, it is important to evaluate the correlation of the output gap patterns to those factors that increase the potential for market power, including load levels and portfolio size. Figure 74 shows the relationship between the output gap from committed resources and real-time load for all hours during 2006.

36 Day-ahead bilateral prices are from Megawatt Daily.

37 The operating costs and startup costs used for this analysis are the generic costs for each resource category type as specified in the ERCOT Protocols.

Figure 74: Output Gap from Committed Resources vs. Actual Load 2006

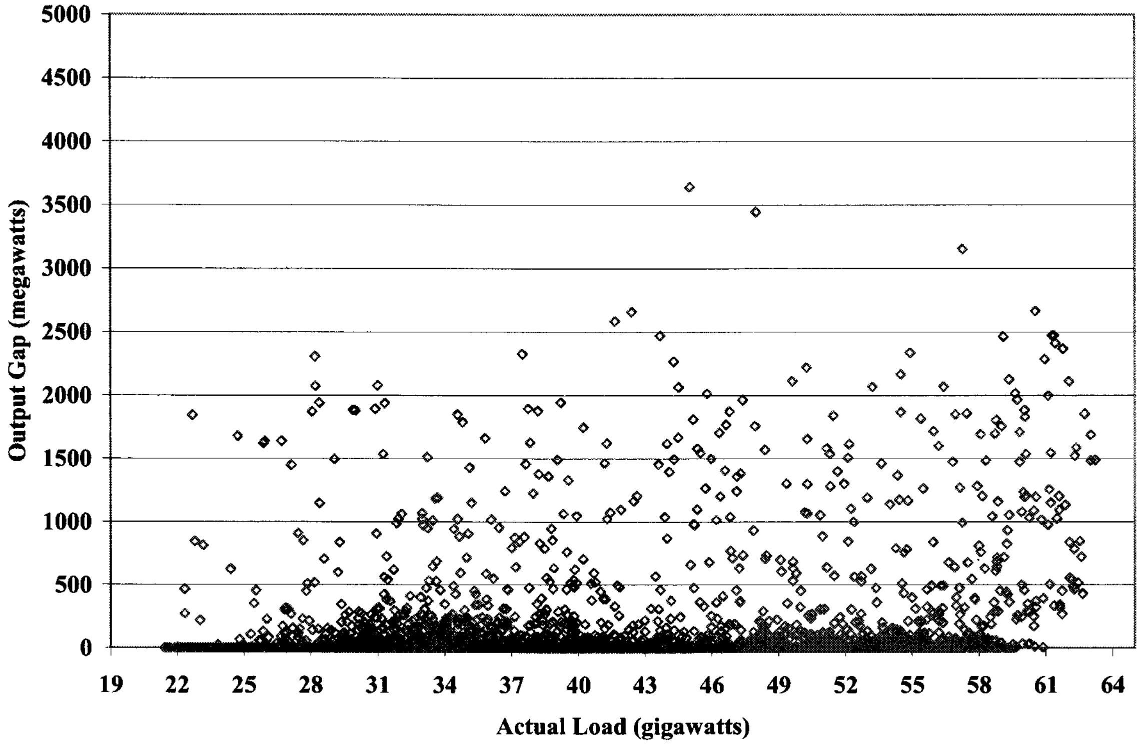

Figure 74 shows that the output gap from committed resources ranged from zero in most hours to a maximum of around 3,500 MW during 2006. As more clearly shown in Figure 75, the average output gap from committed resources rises slightly with real-time demand. This is not surprising given that clearing prices tend to be higher at higher load levels. Many of the high output gap values occurred during transitory price spikes under a wide range of demand levels that make most of the unscheduled energy appear economic. The transitory nature of most of these instances would make a large share of the identified output unavailable due to the resources' ramp limitations. Ramp limitations prevent resources from responding instantaneously to an unpredicted price spike. The next analysis further examines the output gap results by size of supplier and load level.

Figure 75 compares real-time load to the average output gap as a percentage of total installed capacity by participant size. The large supplier category includes the four largest suppliers in ERCOT, whereas the small supplier category includes the remaining suppliers that each controls more than 300 MW of capacity. The output gap is separated into (a) quantities associated with

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uncommitted resources and (b) quantities associated with incremental output ranges of committed resources.

Figure 75: Output Gap by Load Level and Participant Size 2006

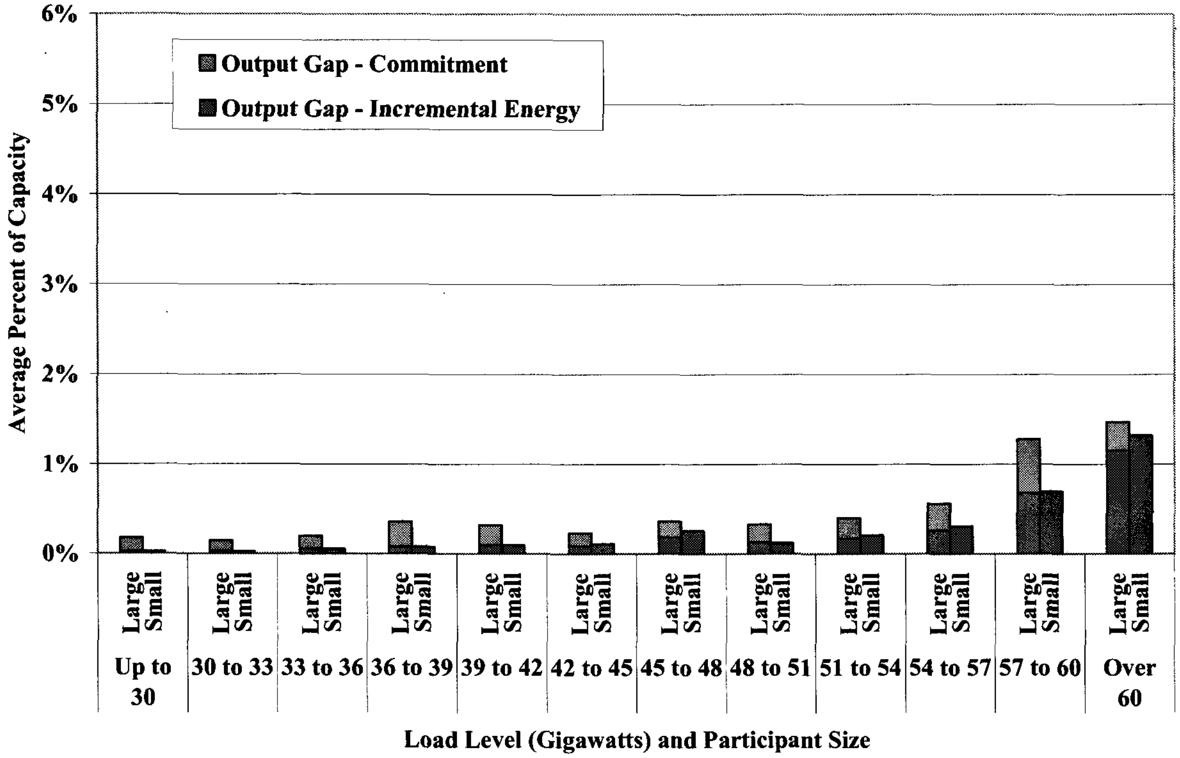

Figure 75 shows that the output gap quantities for incremental energy of large and small suppliers were comparable across all load levels, but that large suppliers had substantially higher output gaps for commitment across all load levels. The greater output gaps for large suppliers were driven primarily by the failure to commit economic resources, as this measure was close to zero over all load levels for small suppliers. However, the overall output gap for both large and small suppliers was reduced considerably in 2006 as compared to 2005. Overall, based upon the analyses in this section, we find that the competitive performance of the market improved in 2006.

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