monthly auction price for congestion rights, and the average congestion price for each CSC through November 2010. Figure 46 shows that the TCR annual and monthly auction prices were higher than the value of congestion for most CSCs in 2010. The exception being monthly auction prices for the West to North interface, which were lower than the actual congestion price in real-time.

Figure 46: TCR Auction Prices versus Balancing Market Congestion Prices

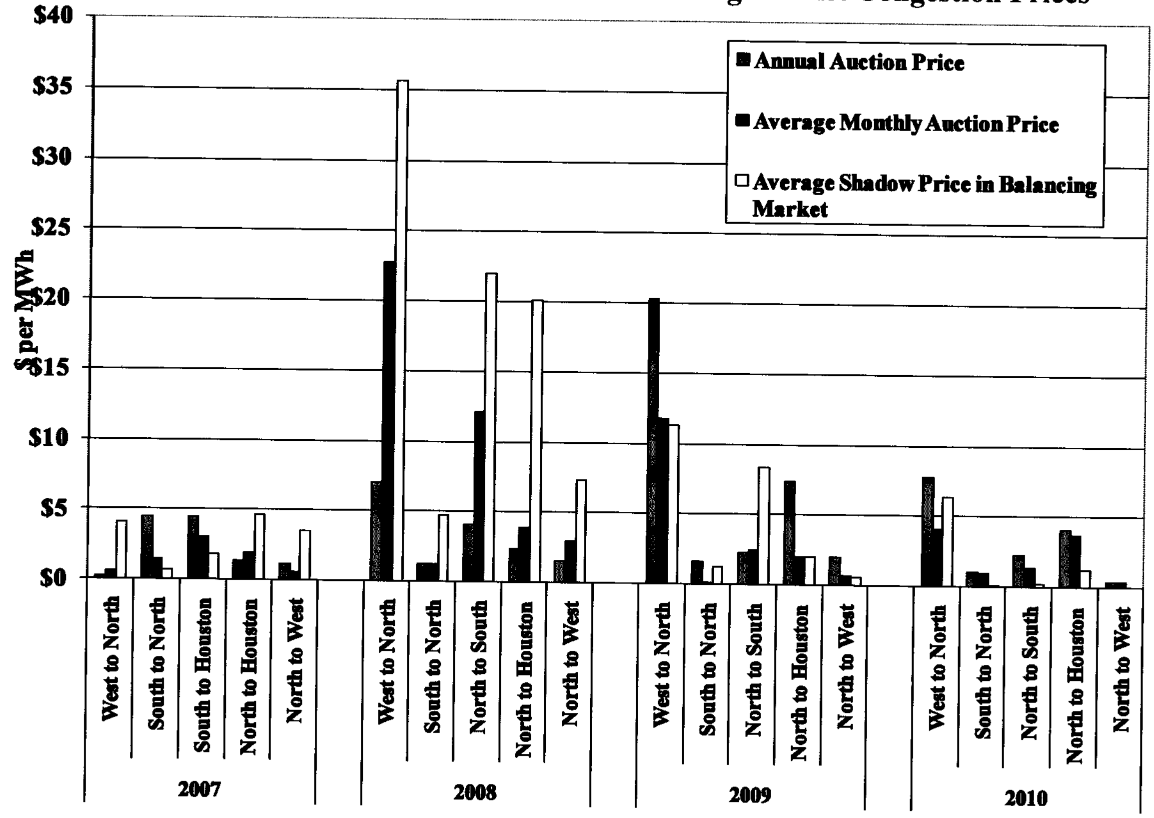
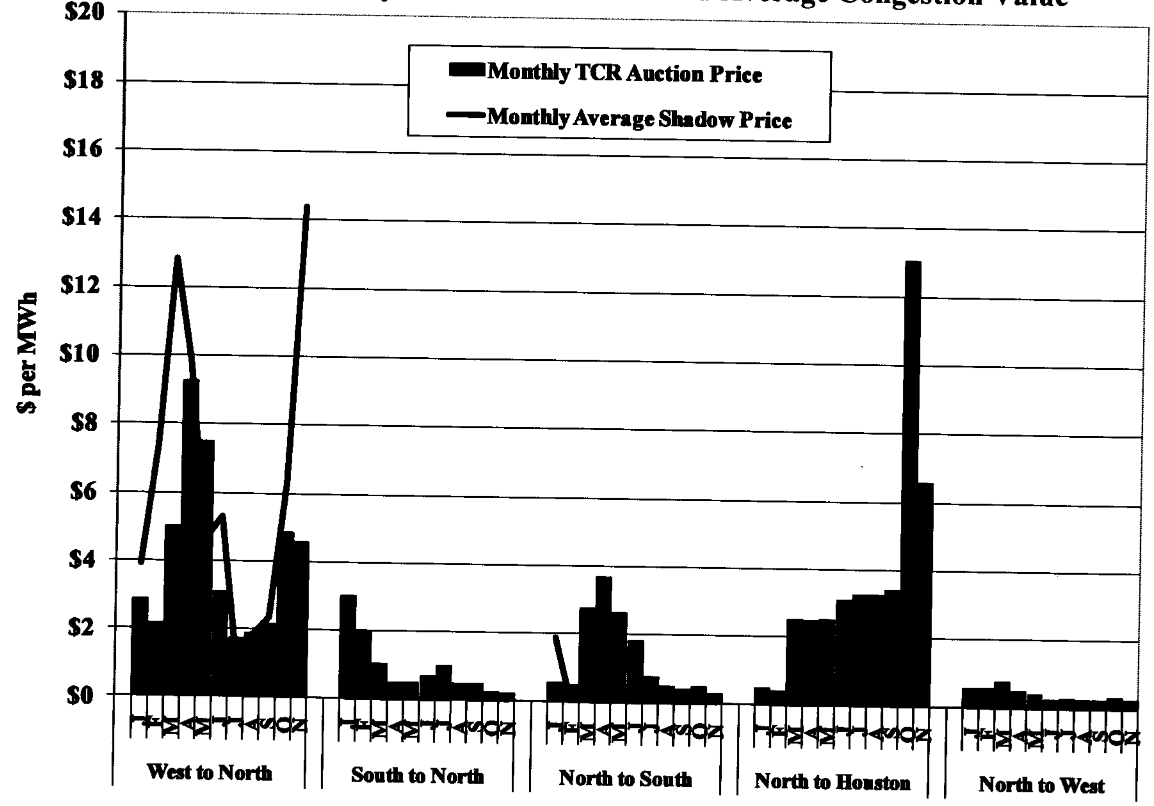


Figure 47 compares monthly TCR auction prices with monthly average real-time CSC shadow prices from SPD for 2010. The TCR auction prices are expressed in dollars per MWh. Consistent with the previous figure, Figure 47 shows that the real-time shadow price is significantly lower than the monthly auction price, except for the West to North interface. However, the monthly auction prices exhibit similar trends as the real-time congestion prices for the West to North and North to Houston interface.

Figure 47: Monthly TCR Auction Price and Average Congestion Value



To evaluate the total revenue implications of the issues described above, our next analysis compares the TCR auction revenues and obligations. Auction revenues are paid to loads on a load-ratio share basis. Market participants acquire TCRs in the ERCOT-run TCR auction market in exchange for the right to receive TCR credit payments (equal to the congestion price for a CSC times the amount of the TCR). If TCR holders could perfectly forecast shadow prices in the balancing energy market, auction revenues would equal credit payments to TCR holders. The credit payments to the TCR holders should be funded primarily from congestion rent collected in the real-time market from participants scheduling transfers between zones or power flows resulting from the balancing energy market.

The congestion rent from the balancing energy market is associated with the schedules and balancing deployments that result in interzonal transfers during constrained intervals (when there are price differences between the zones). For instance, suppose the balancing energy market deployments result in exports of 600 MWh from the West Zone to the North Zone when the price in the West Zone is $40 per MWh and the price in the North Zone is $55 per MWh. The customers in the North Zone will pay $33,000 (600 MWh * $55 per MWh) while suppliers in the West Zone will receive $24,000 (600 MWh * $40 per MWh). The net result is that ERCOT collects $9,000 in congestion rent ($33,000 – $24,000) and uses it to fund payments to holders of TCRs.[19] If the quantity of TCRs perfectly matches the capability of the CSC in the balancing energy market, the congestion rent will perfectly equal the amount paid to the holders of TCRs.

Figure 48 reviews the results of these processes by showing (a) monthly and annual revenues from the TCR auctions, (b) credit payments earned by the holders of TCRs based on real-time outcomes, and (c) congestion rent from schedules and deployments in the balancing energy market.

Figure 48: TCR Auction Revenues, Credit Payments, and Congestion Rent

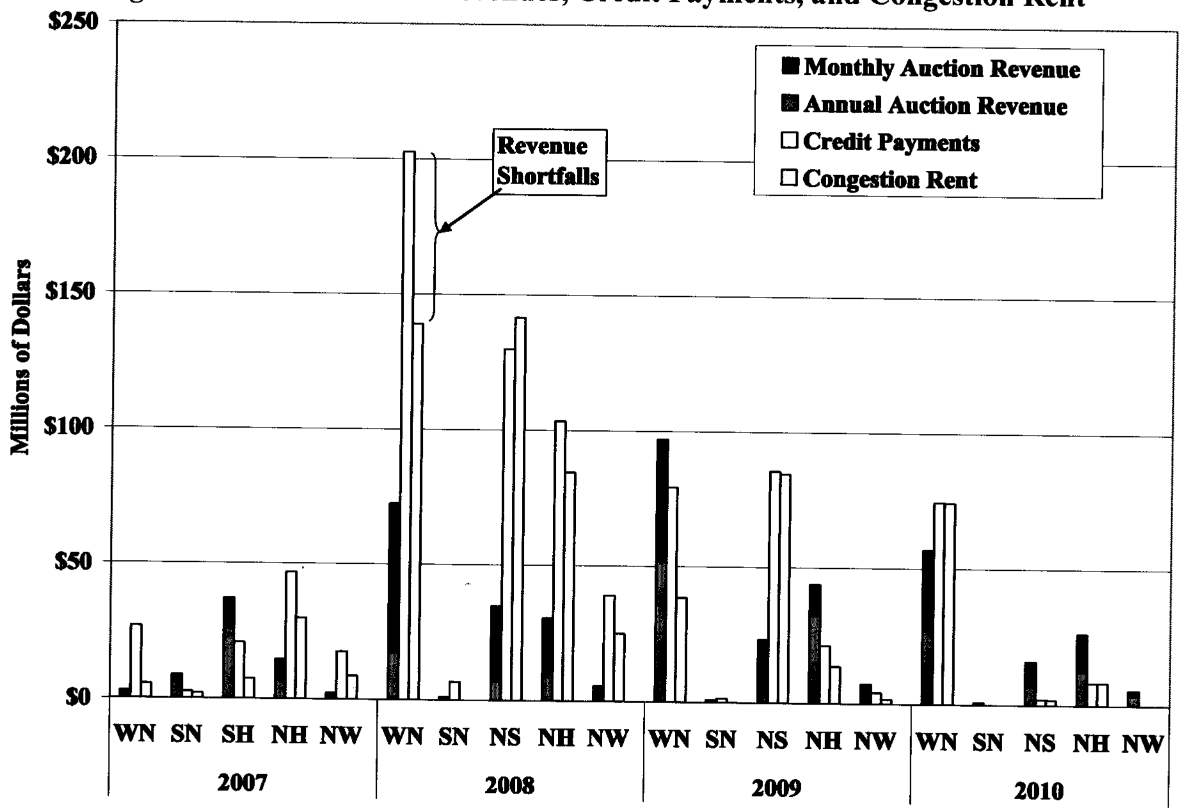


Figure 48 shows that through November 2010, there was very little revenue shortfall for all the CSCs. As described above, a revenue shortfall exists when the credit payments to congestion

19 This explanation is simplified for the purposes of illustration. Congestion rents are also affected by differences between calculated flows on CSCs from interzonal schedules using zonal average shift factors and actual flows on CSCs in real-time. As discussed in this Section, these differences can be significant.

rights holders exceed the congestion rent. This shortfall is caused when the quantity of congestion rights exceeds the SPD-calculated flow limits in real-time. These shortfalls are included in the Balancing Energy Neutrality Adjustment charge and assessed to load ERCOT-wide. Collecting substantial portions of the congestion costs for the market through such uplift charges reduces the transparency and efficiency of the market. It also increases the risks of transacting and serving load in ERCOT because uplift costs cannot be hedged.

E. Local Congestion and Local/System Capacity Requirements

In this subsection, we address local congestion and local and system reliability requirements by evaluating how ERCOT manages the dispatch and commitment of generators when constraints and reliability requirements arise that are not recognized or satisfied by the current zonal markets. Local (*i.e.* intrazonal) congestion occurs in ERCOT when a transmission constraint is binding that is not defined as part of a CSC or CRE. Hence, these constraints are not managed by the zonal market model. ERCOT manages local congestion by requesting that generating units adjust their output quantities (either up or down). When insufficient capacity is committed to meet local or system reliability requirements, ERCOT commits additional resources to provide the necessary capacity in either the day-ahead market or in the adjustment period, which includes the hours after the close of the day-ahead market up to one hour prior to real-time. Capacity required for local reliability constraints is procured through either the Replacement Reserve Service market ("Local RPRS") or as out-of-merit capacity ("OOMC"). Some of this capacity is also instructed to be online through Reliability Must Run ("RMR") contracts. Capacity required for system reliability requirements (*i.e.*, the requirement that the total system-wide online capacity be greater than or equal to the sum of the ERCOT load forecast plus operating reserves in each hour) is procured through either the RPRS market ("Zonal RPRS") or as OOMC.

As discussed above, when a unit's dispatch level is adjusted to resolve local congestion, the unit has provided out-of-merit energy or OOME. For the purposes of this report, we define OOME to include both Local Balancing Energy ("LBE") deployed by SPD and manual OOME deployments, both of which are used to manage local congestion and generally subject to the same settlement rules. Since the output of a unit may be increased or decreased to manage a constraint, the unit may receive an OOME up or an OOME down instruction from ERCOT. For the management of local congestion, a unit that ERCOT commits to meet its reliability requirements is an out-of-merit commitment or OOMC. The payments made to generators by ERCOT when it takes OOME, OOMC, Local RPRS, Zonal RPRS or RMR actions are recovered through uplift charges to the loads. The payments for each class of action are described below.

When a unit is dispatched out of merit (OOME up or OOME down), the unit is paid for a quantity equal to the difference between the scheduled output based on the unit's resource plan and the actual output resulting from the OOME instruction from ERCOT. The payment per MWh for OOME is a pre-determined amount specified in the ERCOT Protocols based on the type and size of the unit, the natural gas price, and the balancing energy price. The net payment to a resource receiving an OOME up instruction is equal to the difference between the formula-based OOME up amount and the balancing energy price. For example, a resource with generic costs of $60 per MWh that receives an OOME up instruction when the balancing energy price is $35 per MWh will receive an OOME up payment of $25 per MWh ($60 minus $35).

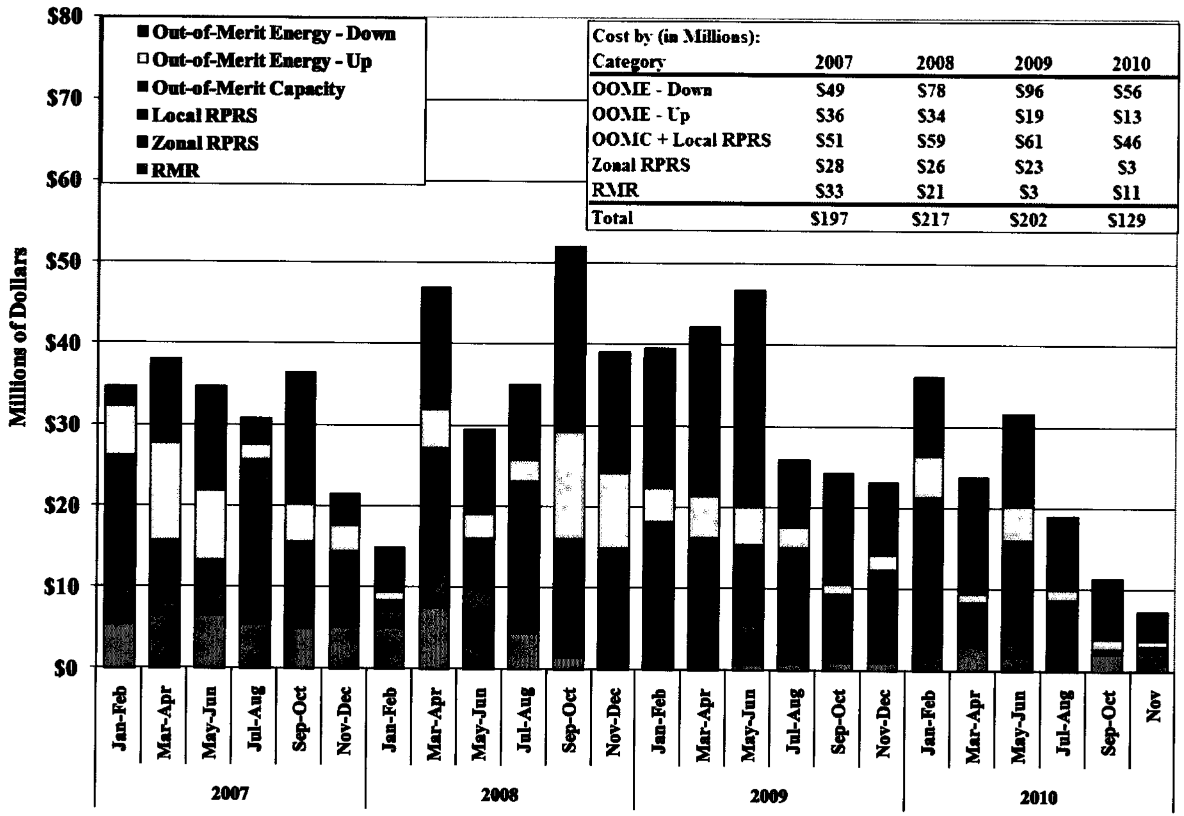
For OOME down, the Protocols establish an avoided-cost level based on generation type that determines the OOME down payment obligation to the participant. If a unit with an avoided cost under the Protocols of $15 per MWh receives an OOME down instruction when the balancing energy price is $35 per MWh, then ERCOT will make an OOME down payment of $20 per MWh.

A unit providing capacity under an OOMC or Local RPRS instruction is paid a pre-determined amount, defined in the ERCOT Protocols, based on the type and size of the unit, natural gas prices, the duration of commitment, and whether the unit incurred start-up costs. Owners of a resource receiving an OOMC or Local RPRS instruction from ERCOT are obligated to offer any available energy from the resource into the balancing energy market. Zonal RPRS is selected based upon offer prices for startup and minimum energy and resources procured for Zonal RPRS are paid the market clearing price for this service.[20]

20 Zonal RPRS for system adequacy is deployed at the second stage of the RPRS run, which is affected by the deployment at the first stage of the RPRS run, or the local RPRS deployment. Because ERCOT Protocols allocate the costs of local and zonal RPRS in the same manner, we have included both as local congestion costs.

Finally, RMR units committed or dispatched pursuant to their RMR agreements receive cost-based compensation. Units contracted to provide RMR service to ERCOT are compensated for start-up costs, energy costs, and are also paid a standby fee. Figure 49 shows each of the four categories of uplift costs from 2007 to 2010.

Figure 49: Expenses for Out-of-Merit Capacity and Energy

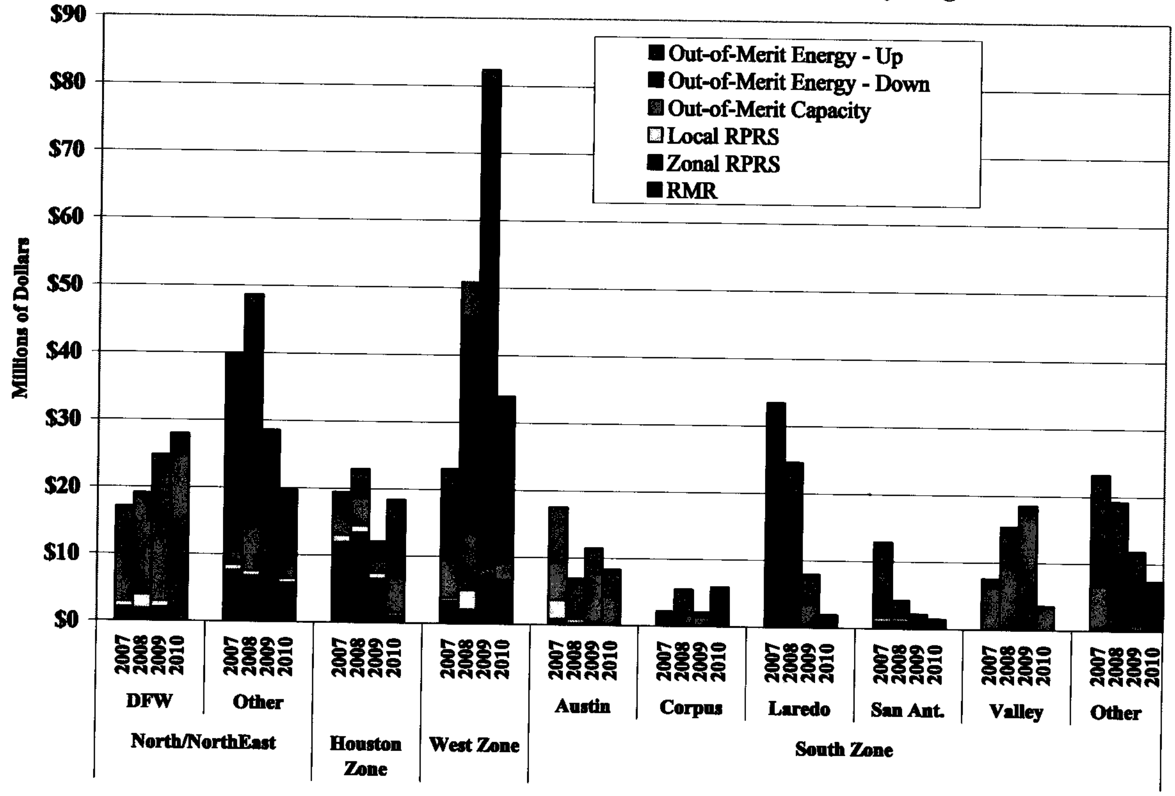


Cost by (in Millions): Category	2007	2008	2009	2010
OOME - Down	$49	$78	$96	$56
OOME - Up	$36	$34	$19	$13
OOMC + Local RPRS	$51	$59	$61	$46
Zonal RPRS	$28	$26	$23	$3
RMR	$33	$21	$3	$11
Total	$197	$217	$202	$129

The results in Figure 49 show that overall uplift costs were $129 million in 2010, which is a $73 million decrease over $202 million in 2009. Even taking into account that there were only eleven months, 2010 had the lowest zonal market uplift costs of the past four years. OOME Down and RPRS costs accounted for the most significant portion of the reduction in 2010. OOME down decreased from $96 million in 2009 to $56 million in 2010. This is primarily attributable to decreases in OOME Down instructions for wind resources in the West Zone. Zonal RPRS cost decreased from $23 million in 2009 to $3 million in 2010.

The rest of the analyses in this section evaluate in more detail where these costs were caused and how they have changed between 2007 and 2010. Figure 50 shows these payments by location.

Figure 50: Expenses for OOME, OOMC and RMR by Region



The most notable change in local congestion costs in 2010 compared to 2009 shown in Figure 50 is the $49 Million reduction in OOME Down costs in the West Zone. This can be attributed to local transmission improvements that allowed more of the wind curtailments to be managed as zonal congestion. Another change was that OOMC costs in the Valley area of the South Zone decreased by $14 million in 2010. This can be attributed to specific generating unit outages leading to high OOMC activity in 2009.

IV. ANALYSIS OF COMPETITIVE PERFORMANCE

In this section, we evaluate competition in the ERCOT market by analyzing the market structure and the conduct of participants for the duration of the operation of the zonal market in 2010. We examine market structure by using a pivotal supplier analysis that indicates suppliers were pivotal in the balancing energy market in 2010 much less frequently than in previous years. These results highlight the trend of continued improvement in the structural competitiveness of the balancing energy market over the last six years. This analysis also shows that the frequency with which a supplier was pivotal increased at higher levels of demand, which is consistent with observations in prior years. 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 these analyses, we find the overall performance of the ERCOT wholesale market to be competitive in 2010.

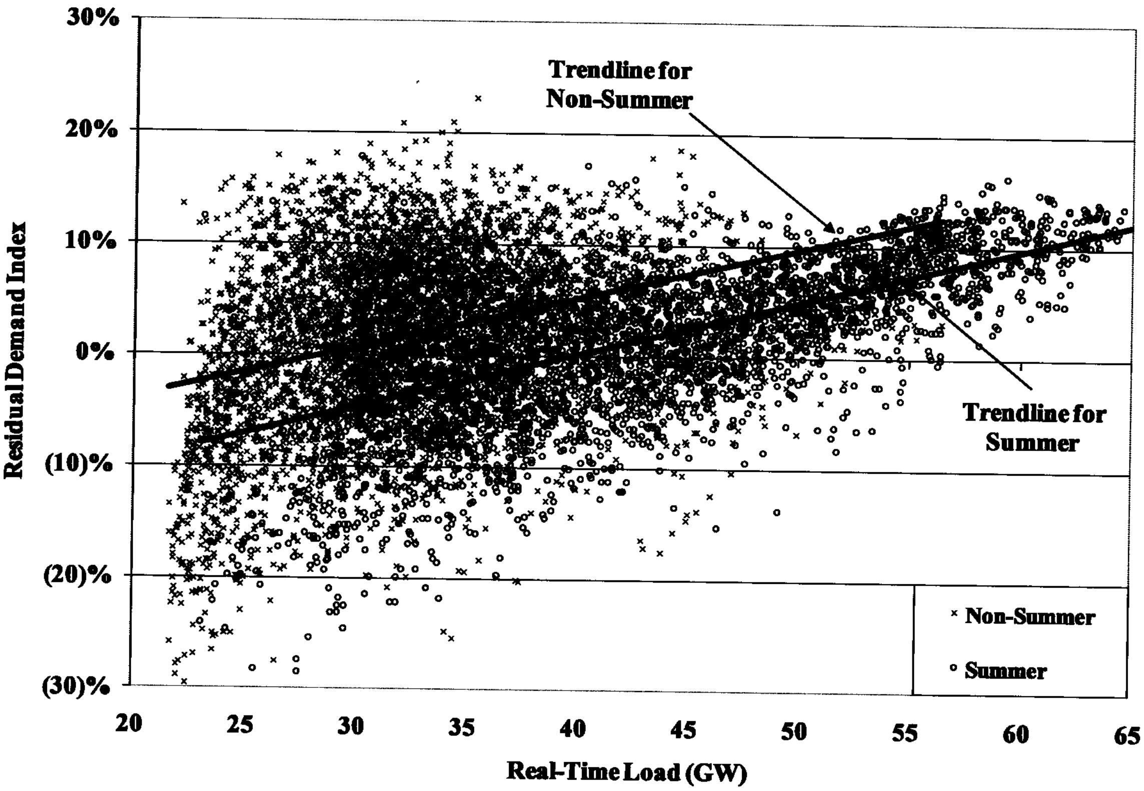
A. Structural Market Power Indicators

We analyze market structure by 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 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 to indicate whether a supplier may have exercised market power. The RDI also does not indicate whether it would have been 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 51 shows the RDI relative to load for all hours through November of 2010. The data are divided into two groups: (i) hours during the summer months (from May to September) are shown by darker points, while (ii) hours during other months are shown by 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 shown below is done at the QSE level because the largest suppliers that determine the RDI values 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.

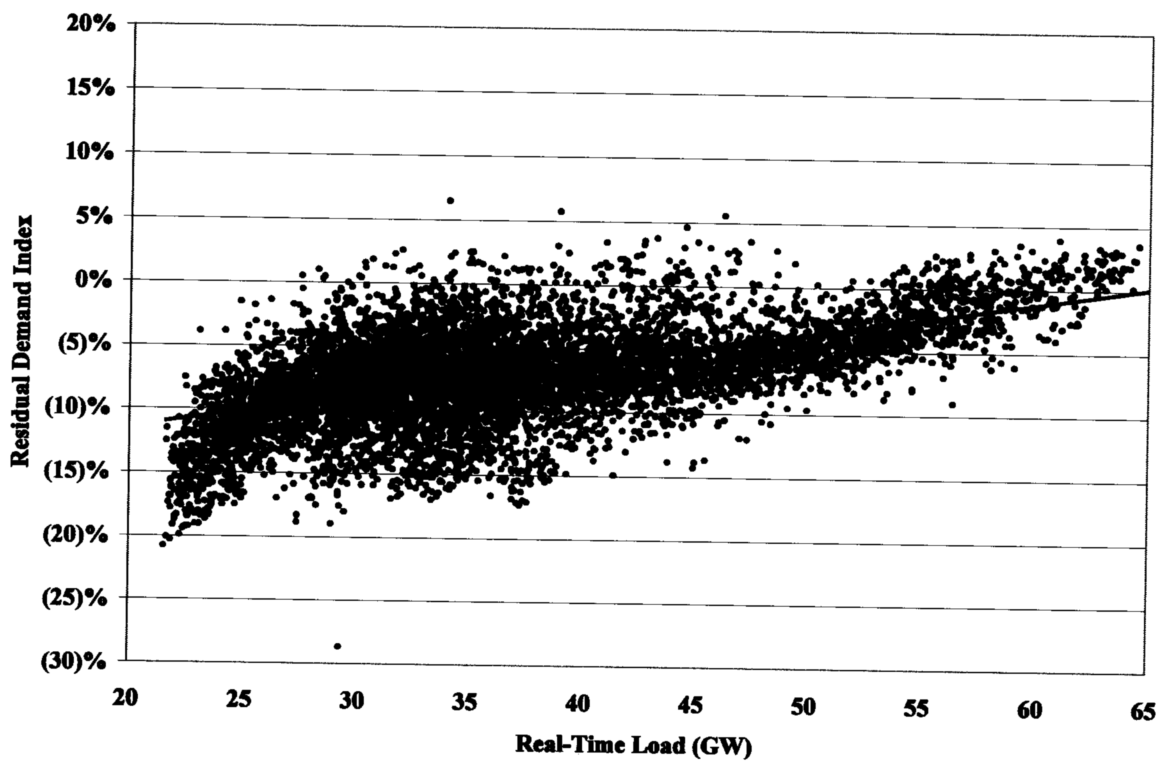
Figure 51: Residual Demand Index



The figure shows that the RDI for the summer (i.e. May to September) was usually positive in hours when load exceeded 40 GW. During the summer, the RDI was greater than zero in approximately 60 percent of all hours. The RDI was comparable 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 53 percent of all hours during the non-summer period. It is important to recognize that 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.

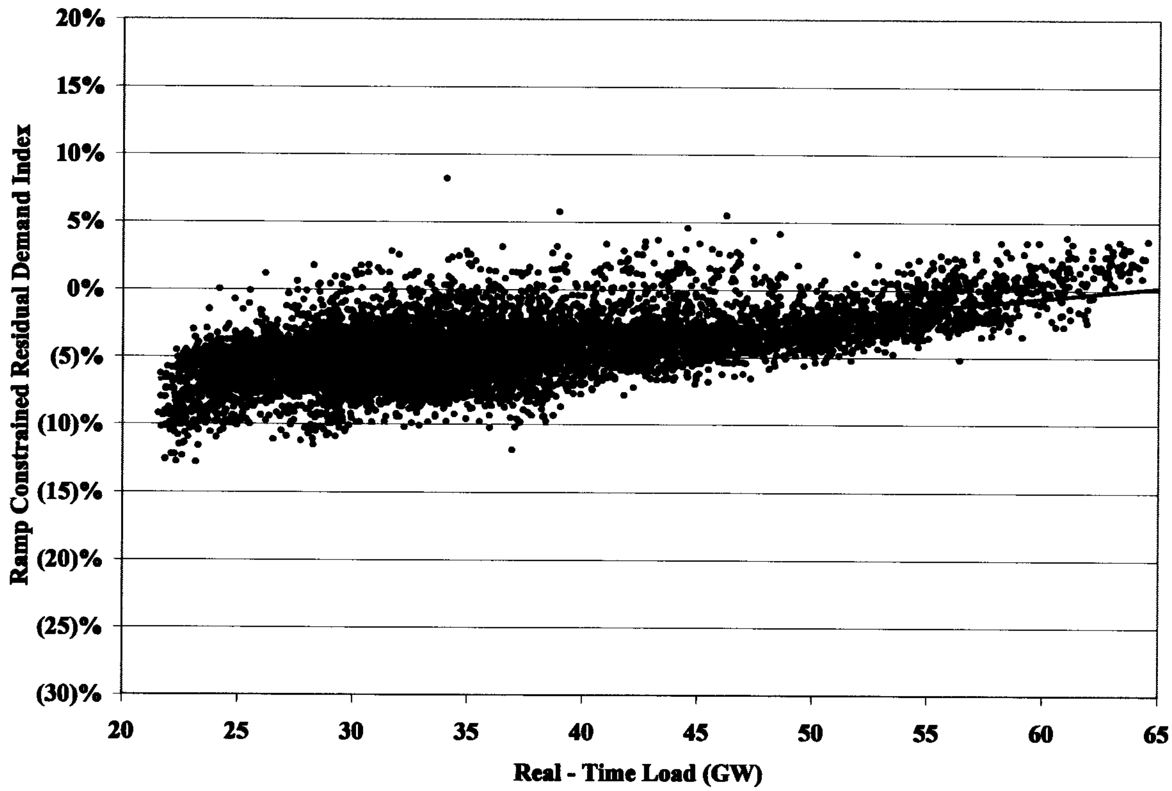
In addition, a supplier's ability to exercise market power in the current ERCOT balancing energy market may be higher than indicated by the standard RDI. Hence, a supplier may be pivotal in the balancing energy market when it would not have been pivotal according to the standard RDI shown above. To account for this, we developed RDI statistics for the balancing energy market. Figure 52 shows the RDI in the balancing energy market relative to the actual load level.

Figure 52: Balancing Energy Market RDI vs. Actual Load



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[21] owned by other suppliers. Figure 52 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 53 shows the same data as in Figure 52 except that the balancing energy offers are further limited by portfolio ramp constraints in each interval.

Figure 53: Ramp-Constrained Balancing Energy Market RDI vs. Actual Load

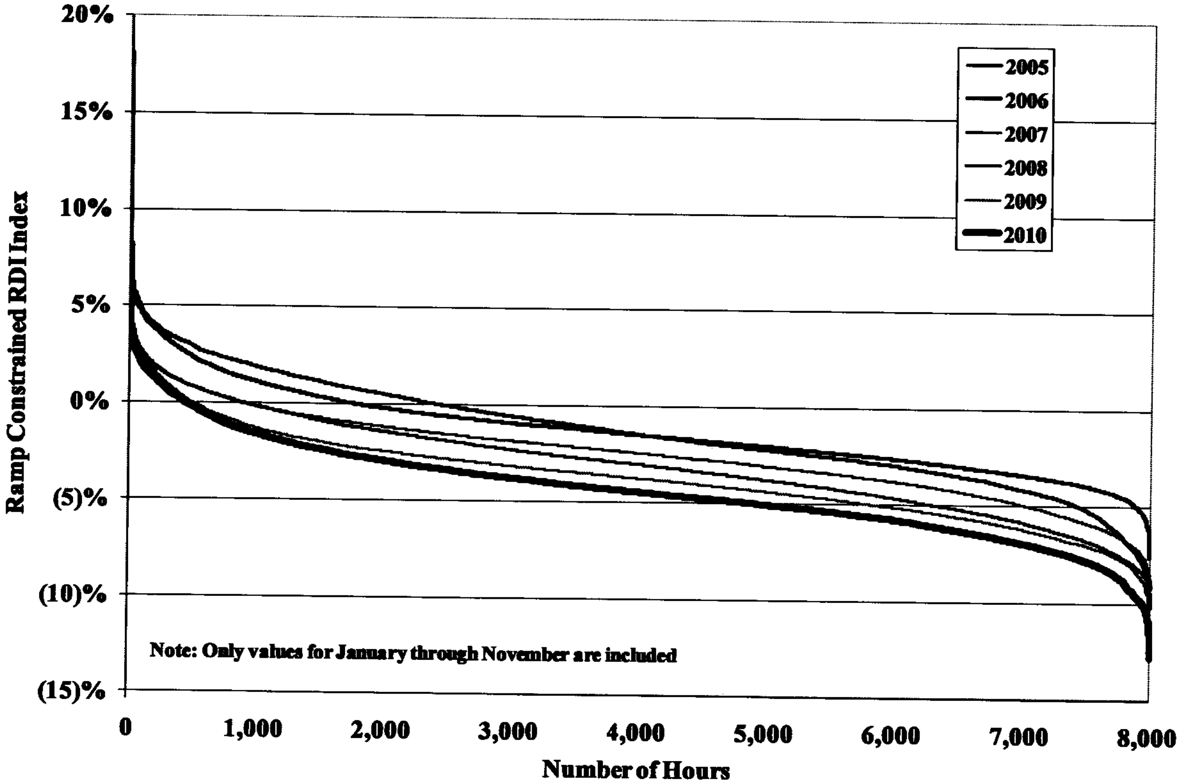


In 2010, the instances when the RDI was positive occurred over a wide range of load levels, from 25 GW to 65 GW. The balancing energy market RDI data and trend line for 2010 are similar in shape to prior years, with the frequency with which a supplier was pivotal generally

[21] 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.

increasing at higher levels of demand. However, the frequency of data points that are positive in 2010 is smaller than the frequency in prior years. This difference is highlighted in Figure 54, which compares the balancing energy market RDI duration curves for 2005 through 2010. To provide a consistent comparison, data is shown for January through November for all years.

Figure 54: Ramp-Constrained Balancing Energy Market RDI Duration Curve



The frequency with which at least one supplier was pivotal in the balancing energy market (*i.e.*, an RDI greater than zero) has fallen consistently; from 29 and 21 percent of the hours in 2005 and 2006, respectively, to less than 11 percent of the hours in 2007 and 2008, to less than 6 percent of the hours in 2009 and 2010. These results highlight the trend of continued improvement in the structural competitiveness of the balancing energy market over the last six years.

B. Evaluation of Supplier Conduct

The previous subsection 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 or economic withholding.

First, we review offer patterns in the balancing energy market. Then we examine 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 only if the withholding firm's incremental profit due to higher price is greater than the lost profit from the foregone sales of its withheld capacity.

1. Balancing Energy Market Offer Patterns

In this section, we evaluate balancing energy offer patterns by analyzing the rate at which capacity is offered.[22] Figure 55 shows the average amount of capacity offered to supply up balancing service relative to all available capacity.

Figure 55 shows a seasonal variation in 2010 over time in quantities of energy available and offered to the balancing energy market. Up balancing offers are divided into the portion that is capable of being deployed in one interval and the portion that would take longer due to portfolio ramp rate offered by the QSE (*i.e.*, "Ramp-Constrained Offers"). Capacity that is available but un-offered is represented by the white dashed portion of each column in the chart.

22 The methodology for determining the quantities of un-offered capacity is detailed in the 2006 SOM Report (2006 SOM Report at 63-65).

Figure 55: Balancing Energy Offers Compared to Total Available Capacity Daily Peak Load Hours

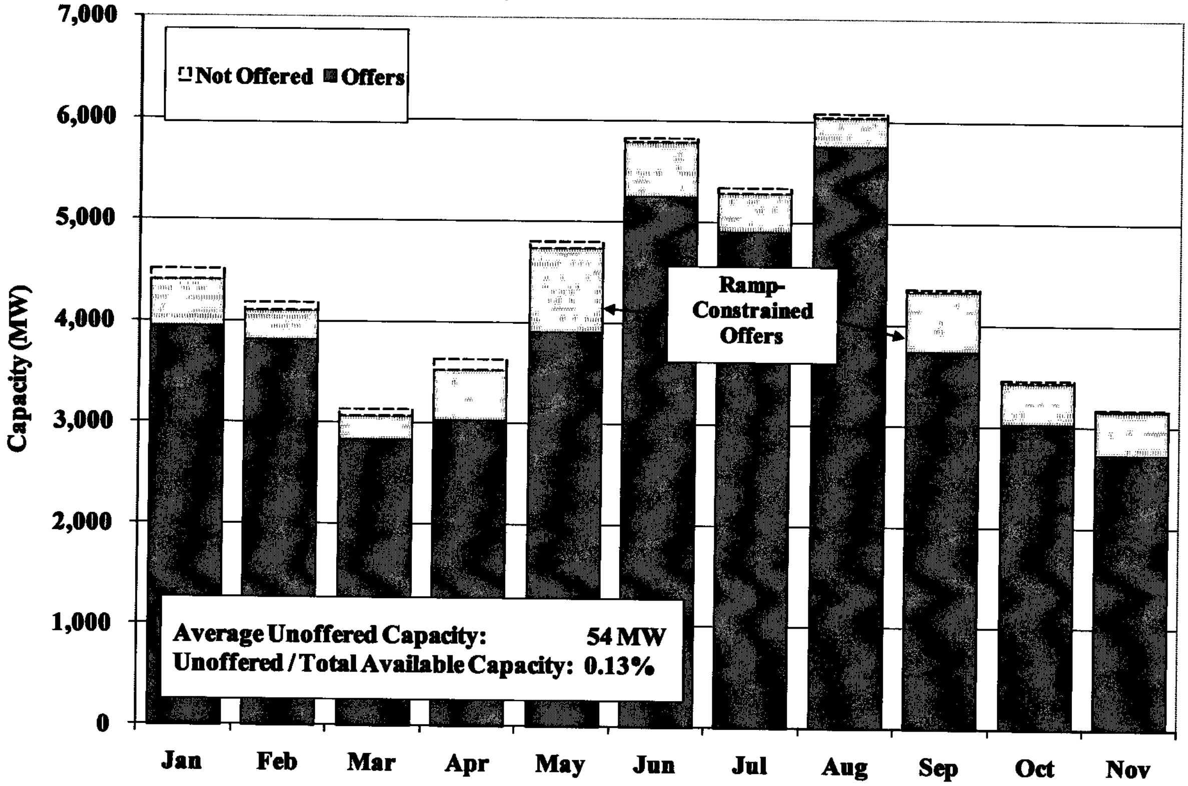
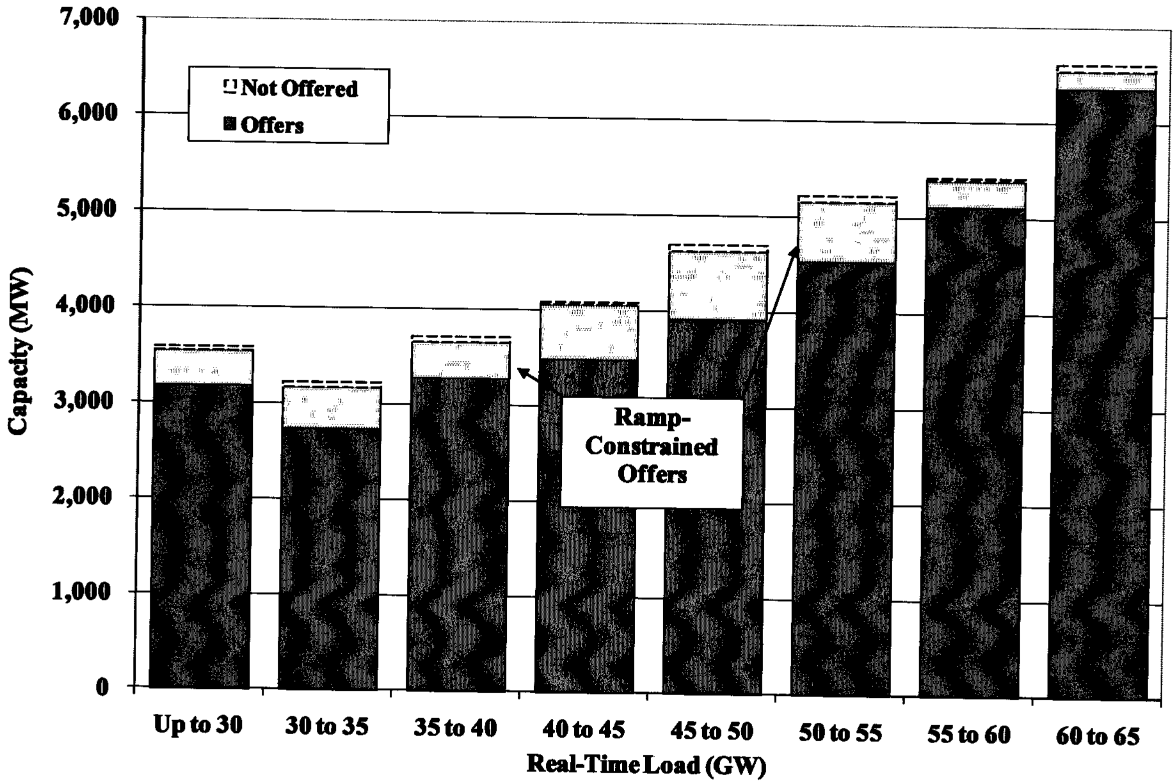


Figure 55 shows a seasonal variation in the quantity of energy available and offered in the balancing energy market, with higher quantities in the summer months than in the non-summer months. This figure also shows that the quantities of un-offered capacity were relatively small in all months in 2010.

Un-offered capacity can raise competitive concerns to the extent that it reflects withholding by a dominant supplier that is attempting to exercise market power. To investigate whether this has occurred, Figure 56 shows the same data as the previous figure, but arranged by load level for daily peak hours in 2010. Because prices are most sensitive to withholding under the tight conditions that occur when load is relatively high, increases in the un-offered capacity at high load levels would raise competitive concerns.

Figure 56: Balancing Energy Offers Compared to Total Available Capacity Daily Peak Load Hours



The figure indicates that through November 2010 the average amount of capacity available to the balancing market increased as demand increased. Conversely, the quantity of un-offered capacity decreased as demand increased.

The pattern of un-offered capacity shown in Figure 56 does not raise significant competitive concerns. If the capacity were being strategically withheld from the market, we would expect it to occur under market conditions most susceptible to the exercise of market power. Thus, we would expect significantly more un-offered capacity under higher load conditions. However, the figure shows that portions of the available capacity that are un-offered decreases as load levels increase. Based on this analysis and the additional analyses in this section at the supplier level, we do not find that the un-offered capacity raises potential competitive concerns.

2. 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 either by derating a unit or declaring it as forced out of service. Because generator 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 are correlated with conditions under which physical withholding would likely be most profitable.

The RDI results shown in Figure 51 through Figure 53 indicate that the potential for market power abuse rises at higher load levels as the frequency of positive RDI values increases. 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 57 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 customarily 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 because of the high variation in the availability of these classes of resources. The large supplier category includes the four largest suppliers in ERCOT. The small supplier category includes the remaining suppliers (as long as the supplier controls at least 300 MW of capacity).

Figure 57: Short-Term Deratings by Load Level and Participant Size June to August, 2010

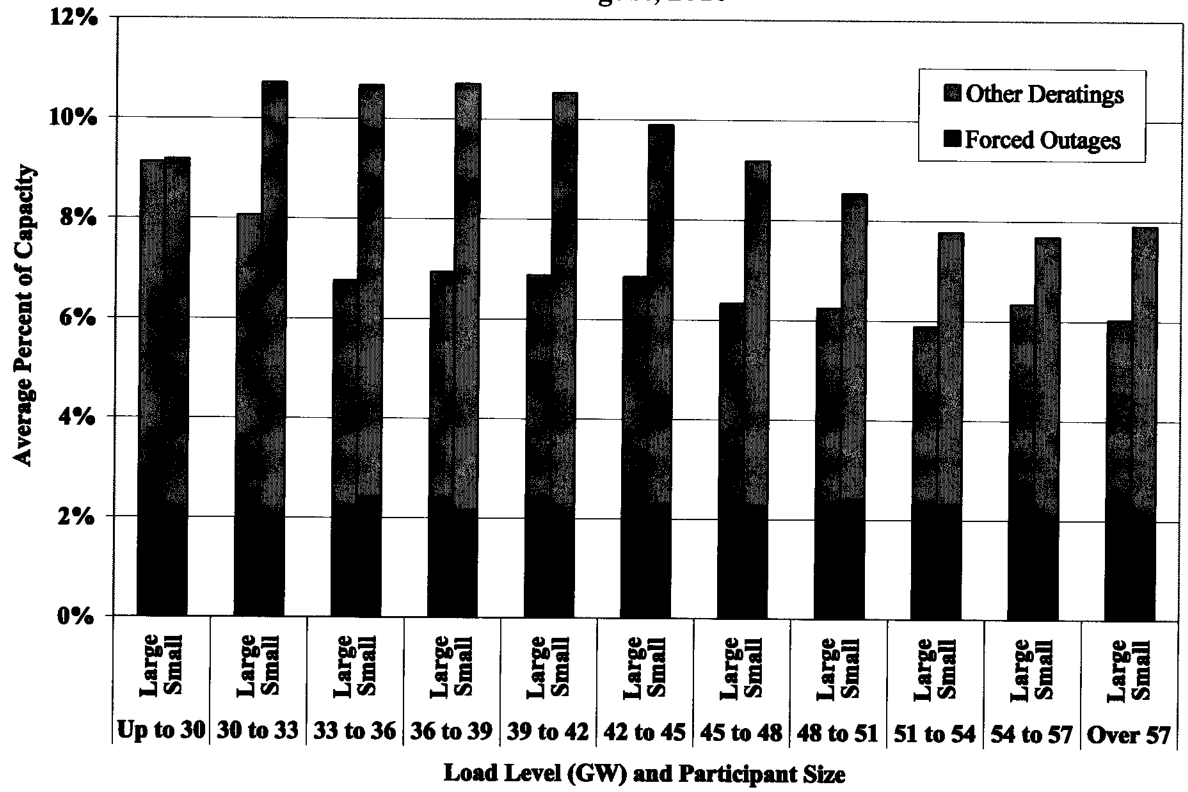


Figure 57 suggests that as electricity demand increases, small market participants tend to make more capacity available to the market, whereas the capacity available from large suppliers is relatively constant across all levels of system demand. For small suppliers, the combined short-term derating and forced outage rates decreased from approximately 11 percent at low demand levels to about 8 percent at load levels above 57 GW. Large suppliers have derating and outage rates that are lower than those of small suppliers across the entire range of load levels. For large suppliers, the combined short-term derating and forced outage rates remained constant, between 6 and 8 percent, across all load levels.

Given that the market is more vulnerable to market power at the highest load levels, these derating patterns do not indicate physical withholding by the large suppliers.

3. 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 its balancing energy offers so as not to be dispatched 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 estimated marginal production cost of energy from that resource 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 day-ahead bilateral zonal market prices as published in *Megawatt Daily*. 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.[23]

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 58 compares the real-time load to the average incremental output gap for all market participants as a percentage of the real-time system demand from 2005 through November 2010.

23 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 58: Incremental Output Gap by Load Level

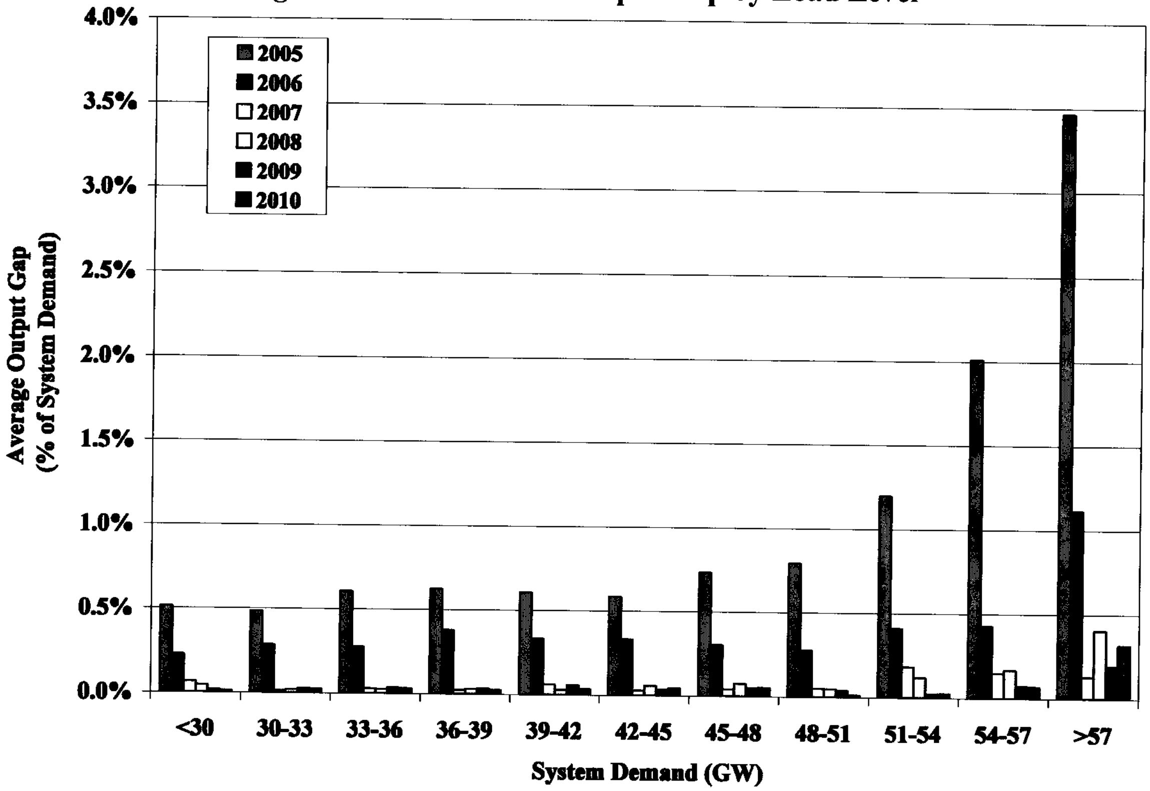


Figure 58 shows that the competitiveness of supplier offers improved considerably in 2006 compared to 2005, followed by even more substantial improvement in 2007 through 2010. Overall, the output gap measures during the first eleven months of 2010 were comparable with the levels in 2009, with all the years showing significant improvement over 2005 and 2006.

Figure 59 compares the average output gap of different sized participants as a percentage of their total installed capacity compared to real-time system load. 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 uncommitted resources and (b) quantities associated with incremental output ranges of committed resources.

Figure 59: Output Gap by Load Level and Participant Size

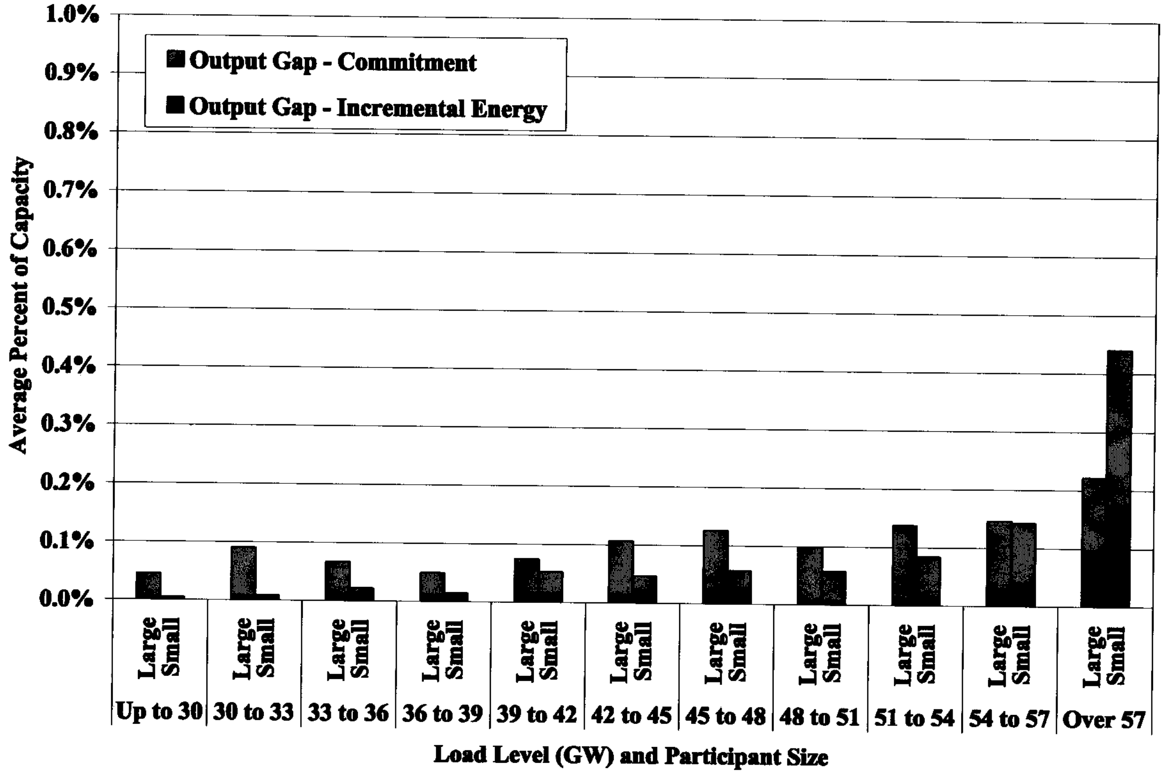


Figure 59 shows that the output gap quantities for incremental energy of large and small suppliers were very low across all load levels during the first eleven months of 2010. Figure 59 also shows that the increase in the incremental output gap for all market participants in 2010 at the highest load levels is not only small in overall magnitude, but is higher for small participants than for large participants, and therefore does not raise competitive concerns.

Overall, based upon the analyses in this section, we find that the ERCOT zonal wholesale market performed competitively in 2010.