Technical Support Document (TSD)

for the Transport Rule

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Electric Generation Ownership, Market Concentration and Auction Size

U.S. Environmental Protection Agency

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Electric Generation Ownership and Market Concentration

In this Technical Support Document (TSD), we explain in more detail the issues and analyses completed for the alternative remedy of State Budgets/Intrastate Trading described in the proposed Transport Rule preamble in section V.D.5. In summary, this option would set state-specific caps for SO_2, NO_X annual, and NO_X ozone season emissions from electric generating units (EGUs) and create separate allowance trading programs within each state in the respective regions starting in 2012. Under this option, EPA would allocate allowances to the covered sources within each state and the covered sources would only be allowed to use for compliance allowances allocated within their state. To address the concentrated nature of numerous state power markets through allocations, under this option some allowances would be withheld from certain sources in each state that control a large share of fossil-fueled power generation, and made available for companies with a small share of generation in the state through auctions.

The first part of this TSD describes the steps EPA took to determine whether the potential for market power may exist if only intrastate trading is allowed. It provides a state by state analysis of electricity generation ownership and why EPA believes electricity markets are sufficiently concentrated to be a concern. Second, this TSD looks at the threshold for auction participation that was chosen. The objective was to have both enough potentially disadvantaged participants to make the auctions competitive, and to have sufficient sources supplying the allowances to each state pool for auctioning. Finally, we discuss the share of allowances that would be available for purchase and why it would be adequate to address the market power problem and meet the needs of owners with a small market share.

Market Concentration

For the State Budgets/ Intrastate Trading option described in the proposal, EPA analyzed power generation ownership by state to determine whether market power would be a potential threat in states within the Transport Rule regions. The analysis was conducted by taking the following steps:

1) EPA ran the Integrated Planning Model (IPM) for the State Budgets/Intrastate Trading option in which allowance trading was limited to intrastate (IPM run "TR_SB_Intrastate_Trading"). We looked at the detailed output parsed files from that IPM model run for 2014 with particular interest in electricity generation (MWh) at the unit level. Specific details about the EGU modeling for this proposal are available in the RIA and the IPM v3.02EISA Documentation.

2) Following the overall IPM modeling, two primary data sets were used for this analysis of market concentration: the 2014 IPM parsed file containing operating projections at the EGU level and holding company information from the Velocity Suite Ventyx database.[1] Units were primarily matched to the parent or holding company using CAMD_ID or ORIS code. Some units were matched by hand due to differences in representing units in each database or multiple ownership of units. In the case of multiple owners, the generation was prorated using percentage of ownership information.

3) Once EGUs were matched with their owners, we summed the total amount of generation owned by each company in each state. The results were sorted by state using pivot tables in Excel and compared to total generation for each state. This allowed EPA to analyze how much generation each holding company or parent owned in each state and calculate each company's share as a percentage of total state generation. Many companies appear multiple times with their share of generation ownership in each state in which they have operations. Any owners with zero generation were excluded. Units that could not be matched have also been omitted.

   In three states, Florida, Missouri and Nebraska, the generation from unmatched EGUs was over 10 percent of the state's total generation. However, excluding these units from the analysis does not change whether the states are considered concentrated or not. In Florida, these additional units would potentially make an already not highly concentrated state even less so. In the case of Missouri and Nebraska where two

[1] http://www.ventyx.com/index.asp

companies own about 70 percent of the total generation in each state, including these units would not change the fact that they are considered highly concentrated markets. The excluded EGUs in the remaining states are generally a small percentage—5 percent or less—of a state's generation and are not believed to have a significant impact on the results that would materially affect EPA's overall analysis of state electricity markets.

Overall, results for amount of electricity generation, number of parent or holding companies, size of parent companies, and market share distribution varied widely from state to state. In all states (except Tennessee and the District of Columbia, which have only one owner and therefore no market share issues), there was at least one company with only a small share—less than 10 percent—of total generation. Additionally, in most states, there was at least one large company with 25 to 50 percent of generation ownership. In extreme cases, one or two entities owned 90 percent or more of the power generation in a state. Another way to look at the results is that 38, or around 5 percent, of the largest generation owners region-wide control more than 40 percent of the generation in this analysis. Of the total 699 companies identified, 615 companies own less than 10 percent of the generation in a state in which they operate (46 entities own between 10 – 25%). These results indicate that there may be disparities among covered sources in the allowance markets and that the capability to exert market power is likely. The results are displayed below in Table 1. In this table, small owners are those that are projected to own 10 percent or less of the state's generation in 2014, medium owners own 10 – 25 percent, and large owners own more than 25 percent.

TABLE 1: PERCENT AND NUMBER OF COMPANIES IN EACH MARKET SHARE CATEGORY BY STATE

	Pct of Generation Owned (MWh)			Number of Companies			
State	**Small**	**Medium**	**Large**	**Small**	**Medium**	**Large**	**Total**
Alabama	15%	20%	65%	9	1	1	11
Arkansas	38%	34%	28%	14	2	1	17
Connecticut	18%	82%	0%	7	4	-	11
Delaware	4%	0%	96%	4	-	2	6
District of Columbia	0%	0%	100%	-	-	1	1
Florida	41%	31%	27%	28	2	1	31
Georgia	16%	12%	72%	18	1	1	20
Illinois	15%	23%	62%	15	1	2	18
Indiana	28%	44%	28%	23	3	1	27
Iowa	19%	0%	81%	56	-	2	58
Kansas	15%	19%	67%	4	1	1	6
Kentucky	27%	12%	60%	10	1	2	13
Louisiana	29%	43%	28%	21	2	1	24
Maryland	5%	0%	95%	8	-	2	10
Massachusetts	19%	16%	65%	23	1	2	26
Michigan	15%	24%	61%	27	1	1	29
Minnesota	19%	23%	59%	26	1	1	28
Mississippi	16%	14%	70%	11	1	1	13
Missouri	10%	33%	57%	11	2	1	14
Nebraska	10%	0%	90%	10	-	2	12
New Jersey	31%	14%	55%	23	1	1	25
New York	52%	48%	0%	50	4	-	54
North Carolina	6%	0%	94%	8	-	2	10
Ohio	16%	51%	32%	24	3	1	28
Oklahoma	34%	26%	39%	20	2	1	23
Pennsylvania	41%	59%	0%	44	4	-	48
South Carolina	11%	11%	78%	6	1	2	9
Tennessee	0%	0%	100%	-	-	1	1
Texas	65%	35%	0%	78	2	-	80
Virginia	31%	15%	54%	14	1	1	16
West Virginia	1%	12%	87%	4	1	2	7
Wisconsin	8%	50%	42%	19	3	1	23
TOTAL				**615**	**46**	**38**	**699**

To further examine the market power concentration, we used the Herfindahl-Hirschman Index (HHI) for the power sector in each state as a way to measure the size of the firms in relation to the industry and as an indicator of the amount of competition. HHI is a commonly accepted measure of market concentration that has been used by the U.S. Department of Justice, the Federal Trade Commission, and state attorney generals to measure market concentration for purposes of antitrust enforcement. The HHI of a market is calculated by summing the squares of

the percentage market shares held by the respective firms. A score of 1,800 or more indicates that the industry is highly concentrated and that the potential for market power may exist. According to our analysis, six states (AR, FL, IN, NY, PA and TX) had HHI scores below 1,800. The remaining HHI scores ranged from 1,817 in Louisiana all the way up to 10,000 in Tennessee and the District of Columbia. These collectively high HHI scores indicate that the electricity markets by state are exceedingly concentrated and that steps may be needed to ensure that markets operate as intended. Table 2 shows the HHI scores for each state in the Transport Rule region. Scores in some states are slightly inflated due to the exclusion of units that could not be matched to owners and were therefore omitted from the HHI calculation.

TABLE 2: HERFINDAHL-HIRSCHMAN INDEX SCORES

State	HHI Score
Alabama	4,715
Arkansas	1,676
Connecticut	1,869
Delaware	4,652
District of Columbia	10,000
Florida	1,471
Georgia	5,429
Illinois	2,557
Indiana	1,555
Iowa	3,634
Kansas	4,898
Kentucky	2,176
Louisiana	1,817
Maryland	4,522
Massachusetts	2,464
Michigan	4,356
Minnesota	4,022
Mississippi	5,129
Missouri	3,844
Nebraska	4,121
New Jersey	3,361
New York	758
North Carolina	4,709
Ohio	2,040
Oklahoma	2,090
Pennsylvania	1,096
South Carolina	4,068
Tennessee	10,000
Texas	956
Virginia	3,254
West Virginia	4,059
Wisconsin	2,644

The preliminary analysis of the generation ownership in each state which showed that a small number of entities own a large share of generation combined with the HHI scores support EPA's concern that market power problems may arise in states where dominant entities with a large share of allowances would be able to control the availability and prices of allowances in the market. The detailed spreadsheet results for the market concentration analysis described in this TSD, "Detailed Analysis of EGU Ownership by State," are available in the docket for this proposal.

Criteria for Auction Participation

Once EPA determined that the potential for excessive market power in numerous state allowance markets was likely, we decided that making a portion of allowances available to potentially disadvantaged entities through auctions would reduce that risk. As explained in the proposal, only entities projected to own 10 percent or less of the generation in a state would be eligible to participate in the state auction. EPA looked at a range of generation ownership percentages and determined that 10 percent would ensure sufficient participation and provide assistance for entities at a potential disadvantage in the allowance market. EPA believes that entities with greater than 10 percent ownership generally own multiple units, receive a considerable share of allowances, and would not need access to auctioned allowances.

The data show that using a 10 percent threshold would allow more than 85 percent of all entities to participate, excluding the very largest owners-- those with the potential to control the markets. Looking at the states individually, we project that at least 60 percent of the owners in every state in the program (except Tennessee and the District of Columbia which have only one EGU owner each) would be eligible and, in some states, up to 90 percent. At the 10 percent threshold, there is at least one large owner that would be required to contribute allowances to the auction. In addition, there are relatively few entities between 10 and 20 percent ownership share, indicating that the majority of entities are either large or small with only a small group in between. In some of the less concentrated markets, a threshold greater than 15 or 20 percent could possibly make all (or nearly all) entities eligible and leave no entities to supply allowances.

Similarly, if a threshold much below 10 percent is applied, then fewer entities will be eligible to participate in auctions, and they may actually have to contribute allowances and they may still face an unfair market. The 10 percent limit helps those potentially disadvantaged

entities and prevents the advantaged ones from controlling the allowance market. The number of entities between 5 - 10 percent of ownership region-wide is not large, but ensuring owners in that range access to allowances through the auctions keeps them from becoming potentially disadvantaged. A lower market share requirement would reduce the number of participants and auction competitiveness, whereas a greater number helps to ensure that auctions remain viable and that prices reflect their market values. In general, looking at the data available to EPA, the 10 percent threshold for auction participation strikes the right balance between those who need access to allowances and those who have access and makes the field more level for all regulated entities.

Percentage of Allowances in the Auctions

EPA believes that the allowance distribution methodology including auctions described in the preamble would provide entities that own a small share of power generation with access to the allowances needed to cover their projected emissions. However, as described in the preamble, there is some amount of inherent variability in electricity generation from year to year that is not fully addressed through allocations. EPA analyzed the variability on a state by state basis for small entities to identify an appropriate size range for the state allowance auctions. The variability analysis for entities with a small market share is similar to the approach used for the variability analysis that was conducted for the State Budgets/Limited Trading remedy described in the proposal. This analysis supports EPA's recommendation for somewhere in the range of 2 to 5 percent of the total available allowances in each trading program in each state be auctioned to entities with a small share of electric generation in a state.

1) Two primary data sets were used for this analysis: heat input data for 2002-2008 and unit level descriptions from the CAMD database and holding company information from the Ventyx database. Units were primarily matched using CAMD_ID or ORIS code. Some units were matched by hand due to differences in representing units in each database, or multiple ownership of units. In the case of multiple owners, the owner of the largest percentage was used. In a handful of cases, since multiple units were co-owned by the same parties, the second largest owner may have been listed as

Some units were excluded because the two data sets could not be matched. It is not expected that these exclusions would impact the analysis, and may in fact make the analysis more conservative (meaning find a greater variability) in its outcome. Only 80 of the roughly 3,750 units included in the variability analysis were excluded because they could not be matched to a holding company.

2) Emission rates used to create the state budgets were matched to each unit. Then, the heat input for each unit was multiplied by the emissions rate to get emissions for annual SO_2 and NO_x, and ozone season NO_x. This provided emission totals that reflected only heat input variability and accounted for any controls known to be installed by the end of 2009.

3) The next step involved rolling up data to the holding company level by state. We determined each holding company's ownership by state using a pivot table. Companies with share of generation equal to 10 percent or less were considered small and identified as such. We then calculated combined annual emissions of small holding companies for each state using a pivot table.

4) Finally, we calculated variability for the companies included for consideration because of their small market share. A line was fit to the emission trends for each state and pollutant. We found expected values for annual emissions for each state and pollutant using the fitted line. Then EPA calculated the differences between the expected and actual (calculated) emissions. We found standard deviation of differences; for 95 percent confidence interval, we multiplied by 1.65 (note this is one-tailed, since only positive deviations are problematic). After that, we divided the variability by the total state budget for each pollutant to determine percent of state budget represented by variability of small holding companies. Setting a 4 percent threshold, we looked at those cases more closely for outlier data and explanations for

TABLE 3: VARIABILITY OF ENTITIES WITH SMALL MARKET SHARE IN TRANSPORT REGION

	Standard Deviation/State Budget (95% confidence interval)		
	SO_2	NOx	OS NOx
Alabama	0.27%	0.32%	0.58%
Arkansas			0.15%
Connecticut	3.20%	2.82%	3.36%
Delaware	0.91%	1.01%	1.50%
District of Columbia	NA	NA	NA
Florida	3.22%	2.22%	1.74%
Georgia	0.34%	0.72%	2.16%
Illinois	1.92%	1.06%	1.53%
Indiana	1.31%	1.20%	2.11%
Iowa	1.67%	1.19%	NA
Kansas	2.10%	1.85%	2.80%
Kentucky	3.87%	0.65%	3.43%
Louisiana	0.01%	2.51%	2.71%
Maryland	3.64%	1.80%	2.41%
Massachusetts	3.72%	6.42%	NA
Michigan	0.47%	1.01%	2.25%
Minnesota	4.00%	3.09%	
Mississippi	NA	NA	3.40%
Missouri	1.74%	0.60%	NA
Nebraska	0.80%	0.55%	NA
New Jersey	37.72%	6.64%	7.30%
New York	11.90%	5.70%	7.02%
North Carolina	0.34%	2.27%	3.72%
Ohio	2.78%	1.83%	3.79%
Oklahoma	NA	NA	1.45%
Pennsylvania	4.36%	1.17%	1.58%
South Carolina	5.73%	3.83%	4.00%
Tennessee	NA	NA	NA
Texas	NA	NA	1.80%
Virginia	3.10%	3.73%	6.07%
West Virginia	1.00%	0.97%	1.52%
Wisconsin	2.39%	1.34%	NA

NOTE: In NJ, large variability can be explained by large changes in heat input patterns at two plants.

For most states and pollutants, variability for holding company considered to have a small market share is less than 4 percent. For states that had variability greater than 4 percent, explanations for the high variability were found, including variability from one or two high emission units (often being used less over time in preference for lower emission units, reducing future impact of these units). Note that all entities will receive allowances through budget allocations regardless of their relative size. However, with variability, covered entities may need access to additional allowances at times. This analysis shows that the variability tends to be within about 4 percent for the smaller owners in most states and that a modest amount of additional allowances would help to ensure that they are able to meet their compliance obligations even when their budget allocations are insufficient.

In a handful of states, an allowance pool for auctioning to small owners is less necessary, because the markets are not highly concentrated. However, for this option, EPA would implement a uniform allowance allocation method and auction format for all included states in each program. The detailed spreadsheet results for the variability analysis of small owners of power generation described in this TSD, "Detailed Analysis of Variability of Entities with Small Market Share," is available in the docket for this proposal.