



MEMORANDUM

To: CBCG

From: Alex Rudkevich, Prashant Murti, Ellen Wolfe

Date: May 22, 2004

Re: TCA Cost-Benefit Study Modeling of Compliance with NO_x Regulations in the Dallas-Ft. Worth Nonattainment Area

This memo describes TCA's proposal for modeling generation dispatch and new entry treatment in the Dallas-Ft. Worth area, given environmental limitations. The memo is organized based on the following discussions:

- Modeling of the dispatch of existing muni- or public utility generating units
- Modeling of the dispatch of IPP generating units
- Treatment of New Entry

The memo presents information related to emissions limits, TCA's proposed representation, and any additional needed to implement the proposed representation.

1. Existing generating units presently (or previously) owned by a municipality or public utility regulated by the PUCT

These generating units are subject to NO_x regulations primarily outlined in Section 1 of Chapter 117 – Control of Air Pollution from Nitrogen Compounds issued by the Texas Commission on Environmental Quality (TCEQ).

Summary of Regulatory Limitations

The primary limit is set on the basis of an individual boiler which is restricted to the emission limit of NO_x of up to 0.033 lb/MMBtu heat input for a large DFW system and 0.06 lb/MMBtu heat input for a small DFW system¹ (Section 117.106(b)).

The regulations allow this limit to be met on a system cap basis (Section 117.108). The system cap is specified individually for each generation owner, on an owner-aggregate basis. The limit has to be met for the entire fleet of generating units controlled by a given owner within the DFW area on a daily- and on a 30-day rolling average- basis.

¹ A *Large DFW system* is defined as the total of all boilers, auxiliary steam boilers, and stationary gas turbines associated with one electric power generating system that has a combined power generating capacity of no less than 500 MW located within a DFW Nonattainment area. A *Small DFW system* is defined as the total of all boilers, auxiliary steam boilers, and stationary gas turbines associated with one electric power generating system that has a combined power of less than 500 MW located within a DFW Nonattainment area.



The daily cap applies to the hourly average over the 24 hour period emission level of the fleet. In other words, on any given day the total for the fleet level of emissions should not exceed the system day's hourly average cap level times 24.

The 30-day rolling average cap applies to any 30 consecutive days. During this time the total level of emissions should not exceed the system 30-day hourly cap times 720 (24×30).

The daily cap for the fleet is computed as a sum across all boilers in the fleet of the product of the emission limit (e.g., 0.033lb/Mmbtu) times maximum heat input of the boiler. Thus, taking the emission limit and multiplying it by the rated capacity of the boiler and then adding these numbers across all boilers should provide a reasonable estimate of the daily cap for the system.

The monthly cap for the fleet is computed similarly to the daily cap. However, instead of using maximum heat inputs, the average heat input for each boiler is used. The average heat input for each boiler is defined as the highest 30-day period average actual heat rate observed over 30 consecutive days within the 3-months periods for three years, July through September of 1996, 1997 and 1998².

Summary of the Modeling Approach

In modeling generating units in this category TCA will take the following approach:

- All owners of generating units in the category will be dispatched subject to the system cap rather than to meet the limits on a boiler-by-boiler basis.³
- TCA made several attempts to obtain through TCEQ monthly NOx limitations by generating unit or by company, but without success.
- Since monthly NOx limitations are not available, TCA will use an alternative approach. For each generation owner in the DFW area, TCA will determine the maximum level of monthly generation for that owner fleet using historical data. The ideal historical data for that purpose would be actual generation by generating unit by month for the 3-months period, July through September for the three years 1996, 1997 and 1998. If ERCOT cannot provide the data to TCA for these years, TCA would, at the minimum need similar data for the 2001-2003 time period. Using these data, TCA will determine the highest 30-day cumulative output for each generating unit. The sum of these highest 30-day generation levels, across all units owned by one company, will be used as the maximum monthly generation limit imposed on that company in GE MAPS.⁴

² According to our data, there are no generating facilities built in the DFW area after 1998 by municipal or PUCT regulated utilities.

³ This assumption is reasonable because generation owners have only two options, either to treat each boiler individually, or to comply with the system cap for all boilers. The latter is always less restrictive than the former.

⁴ This approach effectively derives the NOx limitations from historical generation.

- Although GE MAPS has no built-in logic for modeling limited monthly emission level or monthly energy, it has a built-in logic for limiting monthly fuel use. That logic has sufficient flexibility to produce desirable optimization results. TCA will employ that logic, by converting energy output limits to fuel limits

2. Existing generating units owned by Independent Power Producers (IPPs)

These generating units are subject to NO_x regulations primarily outlined in Section 2 of Chapter 117 – Control of Air Pollution from Nitrogen Compounds, issued by the Texas Commission on Environmental Quality (TCEQ).

Summary of Regulatory Limitations

The primary limit is set on the basis of an individual boiler which is restricted to the NO_x emission limit of 30 parts per million by volume at 3% oxygen, dry basis. This is equivalent to approximately 0.035 lb/MMBtu heat input, which is similar to the limit set for municipal and IOU boilers for a large DFW system. (Section 117.206(b))

Theoretically this limit could be met on a **plant** basis (section 117.207) or on a **source cap** basis (section 117.223). The **system cap** is not applicable for IPPs.

However, from the practical perspective, there are not many generating facilities in the DFW area that fall into this category. Moreover, according to the data provided by ERCOT, no IPP owner in the DFW area holds more than one plant. In this case, Section 207 limitations are less restrictive than Section 223 source cap limitations.

Section 207 plant-based limits are set on a 30-day rolling average basis. The 30-day limit applies to any 30 consecutive days during which the total level of emissions for the plant should not exceed the system 30-day limit times 720 (24 × 30).

Summary of the Modeling Approach

In modeling generating units in this category TCA will take the following approach:

- All owners of generating units in the category will be dispatched subject to the plant level limit rather than meeting the limits on an boiler-by-boiler basis.⁵
- TCA will calculate the monthly limit for each plant as the total heat input, times 0.035 lb/MMBtu, times 720. The total heat input will be estimated by generating unit within

⁵ TCA believes this assumption is reasonable because generation owners have only two options, either to treat each boiler individually, or to comply with the plant level limit. The latter is always less restrictive than the former. TCA also implicitly assumes that all IPP generators are equipped with CEMS or PEMS. As stated earlier, for existing IPPs in the DFW area, Section 207 limitations are less restrictive than Section 223 source cap limitations.



each plant as a product of the unit's rated capacity (in MW) and a heat rate (in MMBtu/MWh).

- TCA will use GE MAPS fuel limitation logic as mentioned in the previous section in order to model the environmental dispatch of existing generating units owned by IPPs.

3. New Entry

TCA understands that new units will be evaluated by TCEQ on a case-by-case basis. TCEQ may prohibit new entry unless the developer can acquire Emission Reduction Credits that are generated by incumbent generators retrofitting to reduce emission rate to a level well below 0.035 lb/MMBtu.

These considerations affect two aspects of modeling new generators in the DFW Nonattainment area, the cost of new entry and the dispatch.

TCA will assume that new entrants will be in an instantaneous compliance with the limitation and therefore, that their dispatch will not be affected by emission limitations.

However, the cost of new entry in DFW will have to be higher than in other areas as a result of the cost of creating emission credits by incumbent generators. Thus, TCA will assume that the cost of new entry will have an adder equal to the value of the emission reduction credit computed on a per kW basis. That adder will be estimated as the cost of SCR equipment times a scaling factor. TCA will rely on the trade press to estimate the costs of SCR equipment. To compute the scaling factor, TCA will estimate the capacity of the existing DFW generating base that would need to be retrofitted with SCR technology in order to create a 1 MW emission credit.

Finally, TCA will assume that if incumbent generators retrofit their boiler for the purpose of selling emission credits to new entrants, they would not alter their dispatch (otherwise they will not qualify for the credit). In sum, the dispatch of generators in the first two categories will remain subject to limitations described in the first two sections above.