APPENDIX 5.1F

Offsets and Interpollutant Offset Ratio Analysis

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Under District Rule 2201, LEC must provide offsets for the portion of the facility emissions after modification that exceed the SJVAPCD offset thresholds. Because the proposed project is a modification to an existing stationary source, the calculation of the offset requirements must account for the emissions from the existing NCPA Lodi facility. Table 5.1F-1 shows annual proposed potential to emit from the new LEC units, the annual potential to emit for the existing units, and the total emissions from the combined facility after modification, and compares these totals with the offset thresholds to determine the offsets required for the project.

TABLE 5.1F-1
Offset Requirements for the LEC

	Annual Emissions, tons			
	NOx	**SOx**	**VOC**	**PM_{10}**
LEC Project Emissions	71.5	24.3	17.5	44.0
Pre-Existing PTE	20.4	5.7	25.9	8.8
Rule 2201 Offset Threshold	10.0	27.4	10.0	14.6
Emissions Required to be Offset	71.5	2.7	17.5	38.2

District Rule 2201 allows the APCO to approve interpollutant offsets on a case-by-case basis. LEC proposes to use the excess SO_2 ERCs as offsets for PM_{10}. The interpolllutant offset ratio analysis in Attachment 5.1F-1 demonstrates that ratio of 1.11 tons of SO_2 for 1 ton of PM_{10} will provide equivalent air quality benefits as required under the NSR rules.

The required quarterly calculation of offsets is provided in Table 5.1F-2. This calculation demonstrates that more than sufficient offsets are being provided to achieve the no net increase provision of the District NSR rule (Rule 2201 §1.0).

Table 5.1F-3 provides a demonstration that sufficient mitigation is being provided under CEQA. Table 5.1F-4 provides documentation regarding the location and method of reduction for each ERC certificate proposed to be used for the project.

Table 5.1F-2
NCPA Lodi Energy Center
Quarterly Offset Summary (lbs/qtr)

VOC					
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual (tpy)
Project VOC Emissions	**8,115**	**8,195**	**9,751**	**8,944**	**17.5**
Pre-Existing PTE	12,780	12,922	13,064	13,064	25.9
VOC Offset Threshold (1)	5,000	5,000	5,000	5,000	10.0
VOC Emissions Required to be Offset (2)	8,115	8,195	9,751	8,944	17.5
VOC ERCs Required for District regulations (3)	**12,173**	**12,293**	**14,626**	**13,416**	**26.3**
VOC ERCs-- Cert No. S-2748-1	22,968	25,523	29,078	28,078	52.8
VOC ERCs Excess (Shortfall)	**10,795**	**13,230**	**14,452**	**14,662**	**26.6**

NOx					
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual (tpy)
Project NOx Emissions	**35,769**	**36,097**	**35,331**	**35,723**	**71.5**
Pre-Existing PTE	10,080	10,192	10,304	10,304	20.4
NOx Offset Threshold (1)	5,000	5,000	5,000	5,000	10.0
NOx Emissions Required to be Offset (2)	35,769	36,097	35,331	35,723	71.5
NOx ERCs Required for District regulations (3)	**53,654**	**54,145**	**52,997**	**53,585**	**107.2**
NOx ERCs					
S-2706-2	0	0	0	1,031	0.5
S-2517-2	1,457	0	1,145	2,959	2.8
S-2519-2	2,682	3,241	938	687	3.8
S-2520-2	23,349	23,151	24,224	24,469	47.6
S-2521-2	1,019	2,105	1,303	264	2.3
S-2522-2	2,296	7,000	9,353	954	9.8
S-2523-2	0	1,437	0	0	0.7
S-2688-2	400	79	4,227	12,090	8.4
C-894-2	129	137	122	177	0.3
C-895-2	8,966	1,122	303	0	5.2
C-808-2	4,702	6,728	3,983	1,831	8.6
N-58-2*	0	0	27,616	0	13.8
N-316-2*	321	274	790	147	0.8
S-2363-2	9,367	22,816	6,006	26,405	32.3
S-2767-2	0	0	0	3,406	1.7
S-2769-2*	5,123	5,415	2,148	3,593	8.1
S-2770-2*	0	9,294	4,654	14,613	14.3
Total	59,811	82,799	86,812	92,626	161.0
NOx ERCs Excess (Shortfall)	**6,157**	**28,654**	**33,815**	**39,041**	**53.8**

Table 5.1F-2 (cont'd)

SOx					
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual (tpy)
Project SOx Emissions	**11,843**	**11,972**	**12,562**	**12,315**	**24.3**
Pre-Existing PTE	2,790	2,821	2,944	2,944	5.7
SOx Offset Threshold (1)	13,688	13,688	13,688	13,688	27.4
SOx Emissions Required to be Offset (2)	945	1,105	1,818	1,571	2.7
SOx ERCs Required for District Regulations (3)	**1,418**	**1,657**	**2,727**	**2,357**	**4.1**
SOx ERCs					
S-2470-5	13,298	10,631	12,619	13,452	25.0
S-2486-5	7,998	9,131	7,319	8,152	16.3
S-2745-5	9,100	9,100	9,080	9,100	18.2
N-641-5	0	0	12,651	0	6.3
N-631-5	0	0	11,045	0	5.5
S-2503-5	2,440	2,467	2,494	2,494	4.9
N-624-5	0	0	3,600	0	1.8
Total	32,836	31,329	58,808	33,198	78.1
SOx ERCs Used for PM10	**23,661**	**24,150**	**28,010**	**16,631**	**46.2**
Total SOx ERCs Used (SOx and PM10)	**25,079**	**25,807**	**30,737**	**18,988**	**50.3**
SOx ERCs Excess (Shortfall)	**7,757**	**5,522**	**28,071**	**14,210**	**27.8**

PM10					
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual (tpy)
Project PM10 Emissions	**21,178**	**21,405**	**23,101**	**22,316**	**44.0**
Pre-Existing PTE	4,320	4,368	4,416	4,416	8.8
PM10 Offset Threshold (1)	7,300	7,300	7,300	7,300	14.6
PM10 Emissions Required to be Offset (2)	18,198	18,473	20,217	19,432	38.2
PM10 ERCs Required for District regulations (3)	**27,298**	**27,710**	**30,325**	**29,148**	**57.2**
PM10 ERCs					
S-2479-4	5,830	5,830	4,500	9,830	13.0
C-769-4	0	0	0	4,244	2.1
N-595-4	81	78	583	58	0.4
C-804-4	10	45	0	28	0.0
C-801-4	60	0	8	5	0.0
Total	5,981	5,953	5,091	14,165	15.6
PM10 ERCs Excess (Shortfall)	**(21,317)**	**(21,757)**	**(25,234)**	**(14,983)**	**(41.6)**
PM10 Reductions from SOx ERCs (at 1.11 to 1.0) (4)	**21,317**	**21,757**	**25,234**	**14,983**	**41.6**
PM10 Reductions Excess (Shortfall)	**0**	**0**	**0**	**0**	**0.0**

Notes:

1. Offset thresholds from SJVAPCD Rule 2201, Table 4.1
2. Offset liability from SJVAPCD Rule 2201, Section 4.7.2
3. Max distance ratio assumed based on SJVAPCD Rule 2201, Table 4.2: 1.5
4. SOx:PM10 ratio evaluation from Attachment 5.1F-1. Us 1.11

Table 5.1F-3
NCPA Lodi Energy Center
CEQA Mitigation Summary

VOC	tons per year
Project VOC Emissions	17.5
VOC ERCs Required for CEQA Mitigation	**17.5**
VOC ERCs-- Cert No. S-2748-1	52.8
VOC ERCs Excess (Shortfall)	**35.3**

NOx	tons per year
Project NOx Emissions	71.5
NOx ERCs Required for CEQA Mitigation	**71.5**
NOx ERCs	
S-2706-2	0.5
S-2517-2	2.8
S-2519-2	3.8
S-2520-2	47.6
S-2521-2	2.3
S-2522-2	9.8
S-2523-2	0.7
S-2688-2	8.4
C-894-2	0.3
C-895-2	5.2
C-808-2	8.6
N-58-2	13.8
N-316-2	0.8
S-2363-2	32.3
S-2767-2	1.7
S-2769-2	8.1
S-2770-2	14.3
Total	161.0
NOx ERCs Excess (Shortfall)	**89.6**

SOx	tons per year
Project SOx Emissions	24.3
SOx ERCs Required for CEQA Mitigation	**24.3**
SOx ERCs	
S-2470-5	25.0
S-2486-5	16.3
S-2745-5	18.2
N-641-5	6.3
N-631-5	5.5
S-2503-5	4.9
N-624-5	1.8
Total	78.1
SOx ERCs Excess (Shortfall)	**53.7**
SOx ERCs Used for PM10	**31.5**
SOx ERCs Excess (Shortfall)	**22.2**

Table 5.1F-3 (cont'd)

PM10	tons per year
Project PM10 Emissions	44.0
PM10 ERCs Required for CEQA Mitigation	**44.0**
PM10 ERCs	
S-2479-4	13.0
C-769-4	2.1
N-595-4	0.4
C-804-4	0.0
C-801-4	0.0
Total	15.6
PM10 ERCs Excess (Shortfall)	**(28.4)**
PM10 Reductions from SOx ERCs (at 1.11 to 1.0) (1)	**28.4**
PM10 Reductions Excess (Shortfall)	**0.0**

Notes:

1. SOx:PM10 ratio evaluation from Attachment 5.1F-1. Use 1.11

Table 5.1F-4
Northern California Power Agency (NCPA) ERCs

ERC Certificate No.	Date of Reduction	Issue date	ERCs Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual	Prevous Owner	Location of Reduction	Method of Reduction
SOx										
S-2470-5	5/18/1993	3/23/2007	13298	10631	12619	13452	50000	Gulf Capital Partners, Inc.	400 South M Street, Tulare, CA	boiler retrofit
S-2486-5	5/18/1993	4/10/2007	7998	9131	7319	8152	32600	Gulf Capital Partners, Inc.	400 South M Street, Tulare, CA	boiler retrofit
S-2745-5	9/10/1979	12/26/2007	9100	9100	9080	9100	36380	Gulf Capital Partners, Inc.	20807 Stockdale Highway, Bakersfield, CA	shutdown of entire stationary source
N-641-5	7/1/1991	5/7/2007	0	0	12651	0	12651	Gulf Capital Partners, Inc.	4000 Yosemite Blvd, Modesto	reduce fuel oil consumption
N-631-5	1/1/1992	4/23/2007	0	0	11045	0	11045	Gulf Capital Partners, Inc.	1785 N Ashby Rd, Merced	fuel limit on boilers
S-2503-5	11/30/1983	4/30/2007	2440	2467	2494	2494	9895	Gulf Capital Partners, Inc.	6500 Refinery Ave, Bakersfield	shutdown of refinery equipment
N-624-5	1/1/1992	5/2/2007	0	0	3600	0	3600	Gulf Capital Partners, Inc.	1785 N Ashby Rd, Merced	fuel limit on boilers
PM10										
S-2479-4	6/30/1995	3/28/2007	5830	5830	4500	9830	25990	Gulf Capital Partners, Inc.	400 South M Street, Tulare, CA	shutdown of feedmill
C-769-4	7/3/1997	12/13/2006	0	0	0	4244	4244	Gulf Capital Partners, Inc.	10833 S Cornelia Ave, Raisin City, CA	shutdown of cotton ginning operations
N-595-4	1/3/2002	2/6/2007	81	78	583	58	800	Gulf Capital Partners, Inc.	3200 E Eight Mile Rd, Stockton, CA 95212	shutdown of boilers
C-804-4	7/27/1994	3/29/2007	10	45	0	28	83	Gulf Capital Partners, Inc.	32180 Auberry Road	shutdown of boilers
C-801-4	11/9/1994	3/29/2007	60	0	8	5	73	Gulf Capital Partners, Inc.	57839 Road 225	shutdown of oil-fired boilers
NOx										
S-2706-2	9/15/2003	12/5/2007	0	0	0	1031	1031	Gulf Capital Partners, Inc.	Bear Mtn Blvd & Gosford Rd, Bakersfield, CA	shutdown of IC engines
S-2517-2	2/24/1992	4/26/2007	1457	0	1145	2959	5561	Gulf Capital Partners, Inc.	Heavy Oil Western Stationary Source 27/28S/21E	convert steam generators to gas firing
S-2519-2	5/20/1992	4/26/2007	2682	3241	938	687	7548	Gulf Capital Partners, Inc.	Heavy Oil Western - S. Belridge, Midway Sunset NE07/32S/23E	convert steam generators to gas firing
S-2520-2	5/20/1992	4/26/2007	23349	23151	24224	24469	95193	Gulf Capital Partners, Inc.	Heavy Oil Western - S. Belridge, Midway Sunset NE35/32S/23E	convert steam generators to gas firing
S-2521-2	5/20/1992	4/26/2007	1019	2105	1303	264	4691	Gulf Capital Partners, Inc.	Heavy Oil Western - S. Belridge, Midway Sunset SE16/31S/22E	convert steam generators to gas firing
S-2522-2	5/20/1992	4/26/2007	2296	7000	9353	954	19603	Gulf Capital Partners, Inc.	Heavy Oil Western - S. Belridge, Midway Sunset SE21/31S/22E	convert steam generators to gas firing
S-2523-2	2/24/1992	4/26/2007	0	1437	0	0	1437	Gulf Capital Partners, Inc.	Heavy Oil Western - S. Belridge, Midway Sunset 28/28S/21E	convert steam generators to gas firing
S-2688-2	2/24/1992	11/14/2007	400	79	4227	12090	16796	Gulf Capital Partners, Inc.	Heavy Oil Western Stationary Source 33/28S/21E	convert steam generators to gas firing
C-894-2	10/8/2002	2/25/2008	129	137	122	117	505	Gulf Capital Partners, Inc.	10701 Idaho Ave, Hanford, CA 93230	shutdown of boilers
C-895-2	11/5/1992	2/25/2008	8966	1122	303	0	10391	Gulf Capital Partners, Inc.	10701 Idaho Ave, Hanford, CA 93230	modification of boiler
C-808-2	10/2/1992	4/26/2007	4702	6728	3983	1831	17244	Gulf Capital Partners, Inc.	2365 E North Ave, Fresno, CA 93725	shutdown of entire stationary source
N-58-2*	7/1/1991	9/2/1994	0	0	27616	0	27616	Del Monte Foods, USA	4000 Yosemite Blvd, Modesto	reduce use of #6 fuel oil in boiler
N-316-2*	5/31/2001	3/14/2003	321	274	790	147	1532	Del Monte Corporation	202 N Filbert, Stockton, CA 95205	shutdown of boilers
S-2363-2	12/5/1990	9/25/2006	9367	22816	6006	26405	64594	Bullard Energy Center, LLC	Elk Hills, Tupman, CA STR NE35/30S/23E	engine retrofit
S-2767-2	4/19/1991	1/28/2008	0	0	0	3406	3406	Bullard Energy Center, LLC	Heavy Oil Western, Belridge Field STR 02/29S/21E	steam generator retrofit
S-2769-2*	5/20/1992	1/28/2008	5123	5415	2148	3593	16279	Bullard Energy Center, LLC	Heavy Oil Western, S Belridge, Midway Sunset STR34/28S/21E	convert steam generators to gas firing
S-2770-2*	2/24/1992	1/28/2008	0	9294	4654	14613	28561	Bullard Energy Center, LLC	Heavy Oil Western Stationary Source STR 34/28S/21E	convert steam generators to gas firing
VOC										
S-2748-1*	9/10/1979	12/26/2007	22968	25523	28078	28078	104647	Frito-Lay North America Inc	20807 Stockdale Highway Bakersfield, CA NE06/30S/26E	shutdown of entire stationary source

Attachment 5.1F-1

Interpollutant Offset Analysis

The objective of an emission offset requirement is to ensure that new projects will have a net air quality benefit in the region. The offset program seeks to achieve this by reducing emissions at one location to balance, or offset, an emission increase elsewhere.

The simplest case involves the generation of emission offsets by reductions from an existing source at, or near, the new source. When the pollutants are the same and the location is the same, the presence or absence of a net air quality benefit is relatively easy to determine: if the new emissions are less than the old emissions, a regional net air quality benefit is achieved.

When the location of the source of offsets is different from the source of new emissions, the areas impacted by the two sources differ. It is often impossible to demonstrate that the area impacted by the new source is benefited everywhere by the reductions from the existing source. Agencies usually address this by setting an offset ratio that takes distance into account. The amount of reductions required is higher than the emission increase, resulting in a net benefit to the region as a whole and to most locations in the impacted area as well. This approach is usually coupled with a requirement to conduct an impact analysis to ensure that no significant increases occur in those areas where the effect of the increase is greater than the benefit from the decrease.

The analysis becomes much more complicated when the proposed reduction is of a different pollutant than that emitted by the proposed new source. The principle is the same: a net air quality benefit must be demonstrated. However, when the offsetting pollutant is different than the new pollutant, the demonstration is not straightforward.

Although the statutory requirement is to show an overall net air quality benefit, the practice has been to apply this test on a pollutant-specific basis. The agencies have allowed the reduction of one pollutant to offset the increase of another pollutant only where the two pollutants can be related, generally because one pollutant is a precursor for the other, or both are precursors for a third pollutant.

The SJVAPCD is not in attainment with the state 24-hour standard for PM_{10}. The District's new source review rule requires offsets for most increases in emissions of PM_{10} and its precursors, which include NOx, SO_2, VOC, and PM_{10}. The applicant will be required to provide offsets for these pollutants. NCPA has purchased NOx, SO_2, VOC, and PM_{10} offsets. However, the applicant has not been able to obtain sufficient PM_{10} offsets available to fully offset project PM_{10} with PM_{10} reductions.

SJVAPCD allows the use of interpollutant offsets, provided the project demonstrates a net air quality benefit and the impact analysis demonstrates that the project does not worsen or cause non-compliance with any ambient air quality standard.

LEC proposes to meet the PM_{10} offset requirements through provision of both direct PM_{10} and interpollutant SO_2 reductions. The impact analysis requirement was addressed in Section 5.1.2.5. This analysis provides a technical basis for determining that the proposed offset ratio for SO_2 to PM_{10} is sufficient to demonstrate a net air quality benefit.

Determining an Offset Ratio

Reductions of precursor pollutants as offsets for the pollutant being formed have been approved by the SJVAPCD for other major projects. See Attachment 5.1G-1.1 for two examples of approved offset ratio calculations (SO_2 for PM_{10} and NOx for PM_{10}).

All examples of projects for which PM_{10} precursors have been accepted as offsets for PM_{10} emissions have based the offset ratio on the relative effect that the precursor emissions have on ambient PM_{10} levels versus directly-emitted PM_{10}. The health benefits due to reductions of ambient concentrations of NOx, SO_2, or ozone have not been considered.

The determination of an appropriate interpollutant offset ratio begins by determining the air quality impact (i.e., ground level concentration) due to directly emitted PM_{10} from sources similar to the new source in units of microgram/cubic meter per ton per year (tpy) emitted. The general methodology is to identify the portion of measured average PM_{10} levels that is attributed to direct PM_{10} emissions from combustion sources, and divide that concentration by the portion of the emission inventory that contributes to it. The result is the theoretical amount that the regional average PM_{10} concentrations would go up for every new ton of PM_{10} directly emitted by the source category.

Next, the same calculation is performed for the portion of ambient PM_{10} that is the result of secondary particulate formation from emissions of the pollutant providing the offsets. If the proposal is to provide SO_2 reductions to offset PM_{10} increases, the sulfate portion of the ambient PM_{10} levels is divided by the SO_2 inventory contributing to formation of those sulfates.

SO_2 for PM_{10}

The SO_2 to PM_{10} interpollutant offset ratio is the amount of SO_2 that would result in 1 $\mu g/m^3$ of ground-level PM_{10} divided by the amount of directly emitted PM_{10} that would result in 1 $\mu g/m^3$ of ground-level PM_{10}.

Ambient PM_{10} Measurements

The SJVAPCD and other jurisdictions recognize that ambient concentrations vary seasonally and require offsets to be provided on a quarterly basis. Recognizing that ambient particulate levels are higher in the winter than other seasons, some districts allow emission reductions from the winter season to be used to offset increases in other seasons, but not vice versa.

All of the criteria pollutants subject to offsets for this project are, or are precursors for, PM_{10}—a pollutant for which offsets are required because, on certain days, ambient levels exceed short-term ambient standards. The agency's goal is to reduce the pollutant levels on the worst days to below the ambient standards.

In determining whether interpollutant offsets provide a net air quality benefit, therefore, it is reasonable to give greatest consideration to the season of most concern, and set a single ratio based on the days when pollutant levels exceed the standards. This approach has been taken previously by the SJVAPCD in setting PM_{10} interpollutant offset ratios.

In the San Joaquin Valley, PM_{10} and $PM_{2.5}$ levels are highest during the late fall and winter. Colder, more stagnant conditions during this time of the year are conducive to the buildup of PM, including the formation of secondary ammonium nitrate.

Source Categories Included in the Inventory

The goal of the offset ratio analysis is to determine what the impact of directly emitted PM_{10} from the new source is, and to compare that with the impact of indirect PM_{10} from the source providing the offsets. Ideally, each source category would be defined as narrowly as possible—for example, individual types of combustion sources, such as power plants and automobiles, would be treated separately—so that the direct and indirect PM_{10} impacts would be related as closely as possible.

However, studies[11] that have quantified the contribution of source categories to measured ambient PM have not been able to make distinctions between similar sources. At present, the best that they can do is determine that a fraction comes directly from wood burning, another fraction comes directly from other combustion sources (automobiles, power plants, etc.), fractions form indirectly from nitrates and sulfates, a fraction comes from marine air, and the rest from various other sources.

Calculations

The interpollutant offset ratio is the number of tons of sulfur dioxide (SO_2) emission reductions that would result in the same reduction in ambient PM_{10} concentration as one ton of direct PM_{10} emissions.

The methodology used to develop an interpollutant offset ratio for SO_2 and PM_{10} uses Chemical Mass Balance (CMB) and rollback modeling from the San Joaquin Valley Air Pollution Control District (SJVAPCD) draft 2007 PM_{10} plan. This methodology was provided by Jim Sweet of the SJVAPCD's Planning Division for use in previous applications.

The data used in this analysis were taken from the District's modeling results for the Modesto 14th Street monitoring station and emission inventories for Stanislaus County. The Modesto station, located 40 miles from Lodi, is the closest station for which all necessary data are available.

The analysis calculates the contribution from subregional industrial combustion-related PM_{10} emissions to PM_{10} concentrations on a PM_{10} episode day, and compares that to the contribution from subregional SO_2 emissions to ammonium sulfate concentrations. The analysis determines the increase in episode PM_{10} concentration (in ug/cu m) that results from a ton of direct industrial combustion-related PM_{10} emissions, and the increase in episode PM_{10} concentration (in ug/cu m) that results from a ton of SO_2 emissions. The ratio of SO_2 impact to direct PM_{10} impact is the interpollutant offset ratio.

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[11] Chemical Mass Balance (CMB) modeling is a way of estimating how much various sources contribute to ambient PM_{10} concentrations. The CMB model uses a computer program whose inputs are source profiles and an ambient PM_{10} sample or samples which have been analyzed for a variety of chemical components. The CMB model finds the mix of sources whose combined amounts of chemical components best approximates those in the ambient sample. In other words, the output of the CMB model is estimates of the relative contributions from the various emissions sources that would result in the specific profile of chemical components that make up the PM_{10} in the ambient sample.

The analysis begins by calculating the ambient concentration of PM_{10} attributed to industrial combustion. The contribution from industrial combustion makes up part of the "vegetative burning" category in the CMB modeling. The industrial component of this category has been estimated to be 30% based on the literature, including the EPA Criteria Document for PM_{10}. Because we are trying to determine the relative benefits of local emission reductions, the contribution from natural sources and transport from outside the region is subtracted from this result. The SJVAPCD estimates that these sources contribute 20% of the measured concentration. According to the rollback modeling, local sources within the smallest area of influence contribute 50% of the measured PM_{10}, after excluding transport and natural sources. The balance is contributed by regional and subregional sources.

The emission inventory associated with the rollback analysis has been provided by the SJVAPCD in the PM_{10} plan. The inventory includes the local component (L1), a broader local component (L2), the subregional component (Sr = County), and the regional component (R = San Joaquin Valley). The concentration calculated by the methodology described in the previous paragraph corresponds to the local component (L1) of the emission inventory.

The local impact is obtained by dividing local concentration by local emissions.

The relative impact (SO_2: PM_{10}) is obtained by dividing the local impact for direct PM_{10} by the local impact for SO_2. This relative impact is the interpollutant offset ratio.

Attachment 5.1F-1.1

Examples of Interpollutant Offset Ratio Calculations Accepted by SJVAPCD, EPA, and CEC

Example 1: Modesto Irrigation District (SJVAPCD, 2003)

SOx for PM_{10}

Ratio proposed: 1.0:1.0

Rationale:

1. Annual average nitrate, sulfate, chloride, and total PM_{10} ambient air measurements used to partially speciate the PM_{10}.
2. Unspeciated PM_{10} split between direct-combustion-related PM_{10} (fuel combustion and mobile sources) and other direct PM_{10} sources
    a. Direct-combustion-related PM_{10} based on Chemical Mass Balance modeling performed for the District's PM_{10} attainment demonstration plan (24-hour models).
3. Annual average direct-combustion PM_{10} concentration is divided by total annual direct-combustion PM_{10} emissions from district-wide inventory.
4. Annual average sulfate concentration is divided by total annual SO_2 emissions from district-wide inventory.
5. Ratio of (3) to (4) represents the amount of SO_2 reductions needed to have equivalent impact on PM_{10} concentrations as reducing 1 TPY of directly emitted combustion PM_{10}.

Example 2: Pastoria Energy Facility (SJVAPCD, 2005)

NOx for PM_{10}

Ratio proposed: 2.16:1

1. Direct-combustion-related PM_{10} based on Chemical Mass Balance modeling performed for the District's PM_{10} attainment demonstration plan (24-hour models).
2. Annual average direct-combustion PM_{10} concentration (attributed to industry) is divided by total annual direct-combustion PM_{10} emissions (from industry) from district-wide inventory.
3. Annual average nitrate concentration (attributed to local [county] sources) is divided by total annual NOx emissions from countywide inventory.
4. Ratio of (2) to (3) represents the amount of NO_2 reductions needed to have an equivalent impact on PM_{10} concentrations as reducing 1 TPY of directly emitted combustion PM_{10}.

Attachment 5.1F-1.2

Detailed Description of SO_2 to PM_{10} Offset Ratio Methodology

PM10 Interpollutant Offset Ratio Analysis
Northern San Joaquin Valley

PM10

	Notes	Units	Estimate
"Vegetative Burning" Total	1	$\mu g/m^3$	30.16
Industry Component (30%)	2	$\mu g/m^3$	9.05
Regional Background (20%)	3	$\mu g/m^3$	1.81
Industry minus Background		$\mu g/m^3$	7.24
County Contribution	4	$\mu g/m^3$	3.62
Organic Carbon PM10 Inventory - Stanislaus County	5	ton/day	4.28
County Impact		$\mu g/m^3$ per ton	0.85

Sulfate

Ammonium Sulfate	6	$\mu g/m^3$	7.40
Regional Background	7	$\mu g/m^3$	1.00
Sulfate minus Background		$\mu g/m^3$	6.40
County Contribution	8	$\mu g/m^3$	3.20
SO2 Inventory - Stanislaus County	9	ton/day	4.20
County Impact		$\mu g/m^3$ per ton	0.76

Tons of SOx to Equal Effect of 1 ton PM10	10	1.11

1. Per SJVUAPCD and CARB, PM10 emissions from stationary industrial combustion sources are included in the Vegetative Burning category from Chemical Mass Balance modeling performed for the SJVUAPCD 2007 PM10 Attainment Plan (Modesto 14th Street station)
2. Per SJVUAPCD, 30% of this category is attributed to stationary industrial combustion sources.
3. Per SJVUAPCD, regional background is estimated to be 20% of net concentration after previous adjustment to Vegetative Burning category.
4. Contribution from sources within Stanislaus County is 50% of net concentration after previous adjustments to Vegetative Burning category.
5. Organic carbon PM10 inventory for Stansilaus County that contributes to this monitoring location; from 2007 PM10 Planning inventory

Step 1: Actual worst-day average nitrate, sulfate, chloride, and PM_{10} ambient air measurements are used to partially speciate the PM_{10}. Missing data are filled in by appropriate gap-filling. In this case, the highest PM_{10} day in 2007 was used.

Step 2: The unspeciated balance of PM_{10} (after subtracting the ammonium sulfate, ammonium nitrate, and ammonium chloride from the total PM_{10}) is split between direct-combustion-related PM_{10} (fuel combustion and mobile sources) and other direct PM_{10} sources. The contribution from direct-combustion can be based on Chemical Mass Balance (CMB) modeling performed for a District's PM_{10} Attainment Demonstration Plan, if available.

Step 3: The region's direct-combustion emissions are obtained from the regional emission inventory. In this case, the winter inventory for planning year 2007 was used.

Step 4: The peak daily average PM_{10} concentration due to direct-combustion sources and the peak daily average sulfate concentration for calendar year 2007 are adjusted (downward) to account for the contribution due to pollution transport. Because the goal is to determine what effect local sources have on regional PM_{10} concentrations, the impact from outside sources must be excluded. In this case, the region is assumed to be upwind of the other districts. No adjustments were made for transport of SO_2 or PM_{10} for this analysis.

Step 5: The direct PM_{10} impact (in units of $\mu g/m^3$ per ton/day) from local combustion sources is calculated by dividing the adjusted direct-combustion-related PM_{10} concentration by the direct-combustion regional PM_{10} emissions. The secondary impact from SO_2 emissions is calculated by dividing the adjusted sulfate concentration by all regional SO_2 emissions.

Step 6: The SO_2 to PM_{10} ratio is determined by dividing the SO_2 impact by the direct PM_{10} impact.