TESTIMONY OF KENNARD F. KOSKY
BEFORE THE FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
CONCERNING ORIMULSION® PSD PERMIT AND SIP REVISION

IV. ENVIRONMENTAL ANALYSIS

A. ESTIMATED EMISSIONS

1. Criteria Pollutants

Orimulsion® is similar in many ways to residual oil currently being burned at the Sanford Plant. The emissions characteristics of Orimulsion compared with other fuels burned (either alone or in combination with other fuels) at the Sanford Plant are presented in Exhibit KFK-1. Currently, a medium-sulfur (i.e., between 1.5 and 2.0 percent) residual fuel oil is burned at the plant, which results in maximum PM and SO_2 emissions of 0.1 and 1.65 to 2.25 $lb/10^6$ Btu heat input, respectively. Higher sulfur (i.e., 2.5 percent) residual fuel oil and a coal-oil mixture have been burned previously; the highest PM and SO_2 emissions using these fuels were 0.7 and 2.75 $lb/10^6$ Btu heat input, respectively.

It is anticipated that test burning of Orimulsion will result in temporarily increased PM and SO_2 emissions for Sanford Unit 4 over currently occurring or permitted levels. For PM and PM10, emissions are expected to be no greater than 0.3 $lb/10^6$ Btu heat input during normal Orimulsion firing and 0.6 $lb/10^6$ Btu heat input during allowed periods of excess emissions. This would result in a maximum 24-hour average PM/PM10 emission rate of 0.34 $lb/10^6$ Btu heat input as shown in Exhibit KFK-2. The proposed emission limit is slightly greater than the uncontrolled emissions observed at the Orimulsion demonstration project at the New Brunswick Power Commission Dalhousie Plant. The proposed particulate emission limit for the Orimulsion test burn was previously approved by FDER for high-sulfur residual oil during the energy emergency of the late 1970s. In addition, the maximum emission rate during the coal-oil mixture test burn was 1.57 $lb/10^6$ Btu.

EXHIBIT
5-D2

Exhibit KFK-1. Comparison of Orimulsion® With Other Fuels Burned at the FPL Sanford Plant

Fuel	Sulfur Content (%)	Heat Input (Btu/lb)	SO_2 (lb/10^6 Btu)	Ash (%)	PM (lb/10^6 Btu)
Current (medium-sulfur residual)	1.5 to 2.0	18,300[a]	1.64 to 2.2	0.10[b]	0.10
Permitted (high-sulfur residual)	2.50	18,300[a]	2.75[b]	0.10[b]	0.10
Coal-Oil Mixture	2.00	15,000	2.75[b]	5.00	0.70
Orimulsion®	2.68	13,000	4.14	0.21	0.22

[a]Typical.
[b]Maximum.

Exhibit KFK-2. Particulate Emissions During Unit 4 Orimulsion® Test Burn

Fuel	PM Emissions ($lb/10^6$ Btu Heat Input)		
	Steady State	Maximum	Average
Current	<0.1	<0.3	<0.125
Permitted	0.1	0.3	0.125
During Test	0.3	0.6	0.34
Coal-Oil Mixture	0.7	1.57[a]	0.7

[a]maximum permitted

Due to the higher particulate rate and testing uncertainties, the maximum opacity is projected to be 60 percent during steady-state operation, and up to 100 percent is requested during periods of excess emissions caused by testing.

Maximum SO_2 emissions would be 4.3 lb/10^6 Btu heat input based on the worst-case Orimulsion fuel quality. Currently, the maximum permitted SO_2 emission rate is 2.75 lb/10^6 Btu or equivalent to 2.5-percent sulfur in residual oil. Total SO_2 emissions from the plant will be minimized by using low-sulfur fuel (i.e., 1-percent oil or a combination of natural gas and oil) in Units 3 and 5. This is illustrated by Exhibit KFK-3.

Nitrogen oxide (NO_x) emissions when firing Orimulsion are expected to be similar to firing residual oil. NO_x emissions during combustion originate from the oxidation of fuel-bound nitrogen and combustion air nitrogen. The amount of NO_x from the oxidation of combustion air nitrogen, so-called thermal NO_x, is dependent on flame temperature, excess air level, and flame dynamics. Although the fuel nitrogen content is higher in Orimulsion than in the residual fuel oil currently being burned, experience in firing Orimulsion has indicated that the high moisture content, i.e., about 30 percent, reduces the peak flame temperature and NO_x formation.

Emissions of carbon monoxide (CO) and volatile organic compounds (VOCs) when firing orimulsion were estimated using EPA emission factors. Combustion characteristics are sufficiently similar for both fuels to conclude that CO and VOC emissions will not be significantly different.

2. <u>Other Regulated Pollutants</u>

For other regulated pollutants, EPA emission factors for residual oil were also used. Emissions data for these pollutants are not available for Orimulsion firing. Laboratory analysis of an Orimulsion fuel sample found that concentrations of these pollutants were below the detection limits of the analytical procedures.

Exhibit KFK-3. Sulfur Dioxide Emissions During Orimulsion® Test Burn

	SO_2 Emissions ($lb/10^6$ Btu Heat Input)		
Unit	Current (Maximum)	Permitted	During Test
Unit 3	2.25	2.75	1.10
Unit 4	2.25	2.75	4.30
Unit 5	2.25	2.75	1.10
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Average	2.25	2.75	2.43

3. Non-Regulated Pollutants

Non-regulated pollutant emissions that occur during the Orimulsion test burn are expected to be similar to emissions during residual oil firing. Concentrations of these parameters, which include trace contaminants, were determined from analyzing a sample of Orimulsion fuel. All reported values were below the detection limits of the analytical procedures.

B. 2.0 AIR QUALITY ANALYSIS APPROACH

1. General Modeling Approach

The modeling approach followed EPA and FDER modeling guidelines for determining compliance with ambient air quality standards (AAQS) and prevention of significant deterioration (PSD) increments. AAQS are maximum concentrations for particular pollutants below which the health and welfare of the general public is protected. PSD increments are concentrations below which the air quality is considered not to be deteriorated.

To develop the maximum short-term concentrations for the proposed facility, the general modeling approach was divided into screening and refined phases. The basic differences between the two phases are the receptor grid used when predicting concentrations and the number of years of meteorological data evaluated.

2. Model Description

The Industrial Source Complex Short-Term (ISCST) dispersion model (EPA, 1987) was used to evaluate the pollutant emissions from the Sanford facility and other existing major facilities in the vicinity. This model is recommended for use by EPA and FDER for applications for point sources such as the Sanford Plant. The dispersion model uses information on local meteorology as well as information on existing sources to predict maximum impacts. Exhibit KFK-4 presents a flow diagram of a dispersion model.

3. Meteorological Data

Meteorological data used in the model to determine air quality impacts consisted of hourly surface weather observations and upper-air soundings from the National Weather Service (NWS) stations at Orlando International Airport and Tampa International Airport, respectively. A 5-year period of meteorological data (1982 through 1986) was used in the analysis. The NWS station in Orlando was selected for use in the study because it is the closest primary weather station to the study area features.