

March 15, 2005

MEMORANDUM

From: William H. Maxwell
CG/ESD (C439-01)

To: CAMR docket OAR-2002-0056

Subject: Analysis of operating oil-fired electric utility steam generating units

In EPA's February 1998 "Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units: Final Report to Congress" (RtC; A-92-55, I-A-90), we stated that the majority of the 137 oil-fired plants in operation at that time were estimated to pose inhalation cancer maximum individual risks (MIR) less than one-in-a-million (1×10^{-6}). However, up to 11 of the 137 oil-fired plants were estimated to potentially present inhalation MIR for cancer above 1×10^{-6} . As shown in the tables below (1 and 2), Ni was the largest contributor to these cancer risks (see RtC at p. ES-12 and OAR-2002-0056-0173).

Table 1. Summary of high-end inhalation cancer risk estimates based on local analysis for oil-fired utilities for the year 1990. (from Table ES-4 in RtC)

HAP	Highest MIR ^a	Population with lifetime risk > 1×10^{-6}	Number plants with MIR > 1×10^{-6}
Nickel ^b	5×10^{-5}	110,000	11
Total ^c (aggregate)	6×10^{-5}	110,000	11

^a Estimated lifetime MIR due to inhalation exposure for the "highest risk" oil-fired plant. Based on an uncertainty analysis, these estimates are considered reasonable high-end estimates (see RtC at section ES.7.4 for discussion).

^b The estimates for Ni and total HAP are based on the assumption that the mix of Ni compounds is 50 percent as carcinogenic as Ni subsulfide.

^c Estimated risk due to inhalation of the aggregate of HAP assuming additivity of risk for 14 individual carcinogenic HAP.

Table 2. Summary of plant-specific risk information for 11 oil-fired plants with MIR potentially above 1×10^{-6} based on local analysis for oil-fired utilities for the year 1990 (See OAR-2002-0056-0173)

Plant	City	State	Maximum predicted risk
			Nickel ^a
Waiau	Pearl City	HI	4.8E-05
Honolulu	Honolulu	HI	1.1E-05
New Boston	South Boston	MA	5.3E-06
Astoria	Astoriak	NY	2.1E-06
Mystic	Everett	MA	1.8E-06
T.G. Smith	Lake Worth	FL	1.8E-06
Bryan	Bryan	TX	1.7E-06
Riviera	Riviera Beach	FL	1.7E-06
Devon	Millford	CT	1.5E-06
Alamitos	Long Beach	CA	1.4E-06
East River	New York	NY	1.3E-06

^a Assumes cancer potency equals 50 percent that of Ni subsulfide.

Since issuance of the February 1998 Report to Congress, we have learned that a number of the 11 plants have reduced or eliminated their Ni emissions through unit closures or fuel switching (OAR-2002-0056-2046; OAR-2002-0056-5998). Of the 42 units that made up the 11 plants, 12 units have permanently ceased operation or are out of service (OAR-2002-0056-2046 at pp. 12 - 13; OAR-2002-0056-5998). Six units have reported to the U.S. Department of Energy (DOE) that their fuel mix now includes natural gas, which was not reported in the earlier data (OAR-2002-0056-5998). An additional five units report using a mix of natural gas and distillate oil (rather than residual oil) in 2003 (OAR-2002-0056-5998). Five units have changed their fuel mixture to natural gas exclusively since the data for the February 1998 report were obtained (OAR-2002-0056-2046 at pp. 12 - 13; OAR-2002-0056-5998). Finally, 2 units fire a residual oil/natural gas mixture and have limited their residual oil use through permit restrictions to no greater than 10 percent of the fuel consumption between April 1 and November 15, with natural gas being used for at least 90 percent of total fuel consumption (OAR-2002-0056-2046 at p. 13). These changes mean that 30 of the original 42 units have taken steps to reduce or eliminate their Ni emissions; only 2 of the original 11 plants, both in Hawaii, have units that appear not to have taken any actions that would result in reduced Ni emissions. Of the 12 units that appear to not have taken steps to reduce or eliminate their Ni emissions, only the eight units at the two Hawaiian plants report using only oil. The remaining four units report firing both oil and natural gas (as was also reported in the RtC). The 11 plants, along with their fuel mix and operational status in 1994 and 2003, are provided in Table 3.

Table 3. Summary of information for 11 oil-fired plants listed in previous table.

Plant	Unit	City	State	Fuel mix/operational status ^a	
				1994 ^b	2003 ^c
Waiau	Waiau 3	Pearl City	HI	Oil	RFO
Waiau	Waiau 4	Pearl City	HI	Oil	RFO
Waiau	Waiau 5	Pearl City	HI	Oil	RFO
Waiau	Waiau 6	Pearl City	HI	Oil	RFO
Waiau	Waiau 7	Pearl City	HI	Oil	RFO
Waiau	Waiau 8	Pearl City	HI	Oil	RFO
Honolulu	Honolulu 8	Honolulu	HI	Oil	RFO
Honolulu	Honolulu 9	Honolulu	HI	Oil	RFO
New Boston	New Boston 1	South Boston	MA	NG/Oil	NG
New Boston	New Boston 2	South Boston	MA	Oil	Not operating
Astoria	Astoria 1	Astoriak	NY	NG/Oil	Not operating
Astoria	Astoria 2	Astoriak	NY	NG/Oil	NG
Astoria	Astoria 3	Astoriak	NY	Oil	RFO/NG
Astoria	Astoria 4	Astoriak	NY	NG/Oil	RFO/NG
Astoria	Astoria 5	Astoriak	NY	Oil	RFO/NG
Mystic	Mystic 4	Everett	MA	Oil	Not operating
Mystic	Mystic 5	Everett	MA	Oil	Not operating
Mystic	Mystic 6	Everett	MA	Oil	Not operating
Mystic	Mystic 7	Everett	MA	NG/Oil	RFO/NG
T.G. Smith	T.G. Smith S1	Lake Worth	FL	Oil	NG/RFO
T.G. Smith	T.G. Smith S2	Lake Worth	FL	Oil	Out of service
T.G. Smith	T.G. Smith S3	Lake Worth	FL	Oil	NG/RFO
T.G. Smith	T.G. Smith S4	Lake Worth	FL	Oil	Out of service
Bryan	Bryan 3	Bryan	TX	Oil	NG/DFO
Bryan	Bryan 4	Bryan	TX	Oil	NG/DFO
Bryan	Bryan 5	Bryan	TX	Oil	NG/DFO
Bryan	Bryan 6	Bryan	TX	NG/Oil	NG/DFO
Bryan	Bryan 7	Bryan	TX	Oil	NG/DFO
Riviera	Riviera 3	Riviera Beach	FL	NG/Oil	RFO/NG
Riviera	Riviera 4	Riviera Beach	FL	NG/Oil	RFO/NG
Devon	Devon 3	Millford	CT	Oil	Not operating
Devon	Devon 4	Millford	CT	Oil	Not operating
Devon	Devon 5	Millford	CT	Oil	Not operating
Devon	Devon 6	Millford	CT	Oil	Not operating
Devon	Devon 7	Millford	CT	Oil	RFO/NG
Devon	Devon 8	Millford	CT	Oil	RFO/NG
Alamitos	Alamitos 2	Long Beach	CA	NG/Oil	NG
Alamitos	Alamitos 4	Long Beach	CA	NG/Oil	NG
Alamitos	Alamitos 5	Long Beach	CA	NG/Oil	NG

East River	East River 5	New York	NY	Oil	Not operating
East River	East River 6 ^d	New York	NY	Oil	RFO/NG
East River	East River 7 ^d	New York	NY	Oil	RFO/NG

- ^a RFO - Residual fuel oil
DFO - Distillate fuel oil
NG - Natural gas
- ^b RtC; OAR-2002-0056-0173
- ^c Existing Generating Units in the United States by State, Company and Plant, 2003; existing generating units as of January 1, 2004 (OAR-2002-0056-5998)
- ^d Agreement limits fuel oil use to less than 10 percent of fuel consumption between April 1 and November 15. Natural gas used for at least 90 percent of fuel consumption (OAR-2002-0056-2046)

It is likely that this same mix of unit retirements and fuel mixture changes have been occurring throughout the oil-fired segment of the electric utility industry in the past decade. The number of operational oil-fired electric utility units has declined substantially between 1994 and 2003. The risk determination reported in February 1998 was based on 309 units at 137 plants (RtC; OAR-2002-0056-0173); the inventory of oil-fired units in 2003 has decreased to 142 units (18 of which are listed as being either “out of service” or “on standby” and some of which may not meet the definition of an “electric utility steam generating unit”) at 74 plants (OAR-2002-0056-5998). This decreasing trend in the number of oil-fired units is expected to continue. The latest DOE/EIA projections (OAR-2002-0056-5999) estimate no new utility oil-fired generating capacity and decreasing existing oil-fired generating capacity through 2025, with an additional 29.2 gigawatts of combined oil- and natural gas-fired existing capacity being retired by 2025.

Further, during the public comment period, a number of commenters (OAR-2002-0056-2046, -2910, -2912, -5282, -5284) provided EPA with information indicating that the level of sulfidic Ni (the form of nickel considered to have greatest carcinogenic potency) emissions from oil-fired utility units is less than had been estimated in the RtC.

In summary, at the time of the RtC, MIR estimates for Ni emissions at 11 coal-fired utilities were greater than 1×10^{-6} , with the highest plant MIR being 5×10^{-5} . Many of these 11 units now either no longer operate or currently use natural gas, from which there are negligible Ni emissions. As for the remaining units, available projections indicate a continued decrease in generating capacity (with some uncertainty as the projections include oil- and gas-fired units in the same category), a lack of new capacity, and the increasing retirement of units.

Because of (1) the dramatic reductions in the total nationwide inventory of oil-fired electric utility steam generating units (more so than we had envisioned previously); (2) the changing fuel mixtures being used at the remaining units; and (3) the reduced levels of sulfidic Ni likely being emitted from oil-fired utility units, current levels of oil-fired utility Ni emissions are believed to pose substantially lower risk than the 1998 analysis (RtC) had concluded.