

DRAFT: FOR DISCUSSION PURPOSES ONLY

Shore Power Draft Assumptions: Power, Load, Activity, and Emission Factors

(Summary provided by the South Coast Air Quality Management District, November 2004)

Auxiliary Engine Power and Load Assumptions

Ship Type	Average Number of ICEs			Average kW			Total Average Auxiliary Power (kW)			Load Factor		
	POLA	POLB*	POLB Range	POLA	POLB*	POLB Range	POLA	POLB*	POLB Range	POLA	POLB*	POLB Range
Container	3.78	3.50	2 - 4	1,520	1,575	1,360 - 2,500	5,746	6,035	2,700 - 8,400	0.17	0.50	0.11 - 0.63
Tanker	2.94	2.70	2 - 4	675	975	400 - 2,200	1,985	1,950	1,300 - 2,600**	0.67	0.56	0.23 - 0.89
Cruise	5.00	2.00	no range	2,200	5,280	no range	11,000	10,560	no range	0.64	0.66	no range
Reefer	4.00	5.00	no range	325	1,124	940 - 1,860	1,300	5,620	no range	0.34	0.62	no range
Bulk	3.02	3.00	no range	387	700	no range	1,169	2,100	no range	0.22	0.29	no range

* Calculated from average of listed vessels

** One tanker has a diesel electric propulsion system that supplies hotelling needs (so no auxiliary engines). This engine was left out of the calculated average because it was not representative of other auxiliary engines in the Study group

Auxiliary Engine Activity Assumptions

	Calls*		Hotelling Times (hrs)				
	Low	High	POLA	POLB**	POLB Range	Arcadis	Average
Container	5	10	42.80	69.75	44.0 - 122.0	51.1	54.55
Tanker	5	25	30.16	40.23	32.0 - 55.0	62.2	44.20
Cruise	25	40	10.47	12	no range	9.5	10.66
Reefer	1	25	29.00	67.9	no range	38.5	45.13
Bulk	1	5	72.16	60	no range	102.8	78.32

*From POLB study of listed vessels

** Calculated from average of listed vessels

Auxiliary Engine Emission Factor Assumptions

Ship Type	NOx (g/kW-hr)			PM (g/kW-hr)			SOx (g/kW-hr)*****		
	POLA	POLB*	Arcadis**	POLA***	POLB*	Arcadis**	POLA	POLB****	Arcadis**
Container	14.7	13.36	14.7	0.8	1.52	0.58	12.3	12.0	8.0
Tanker	14.7	13.36	14.7	0.8	1.52	0.58	12.3	12.0	8.0
Cruise	14.7	13.36	14.7	0.8	1.52	0.58	12.3	12.0	8.0
Reefer	14.7	13.36	14.7	0.8	1.52	0.58	12.3	12.0	8.0
Bulk	14.7	13.36	14.7	0.8	1.52	0.58	12.3	12.0	8.0

note: assumes medium speed engine using residual fuel

* POLB Study based their emission factors on the EPA RIA for 1999 Marine Engine Regulation

** Units of lbs/hour

*** POLA Study incorrectly stated ENTEC emission factor for PM on MSD using RO as 0.3*

**** Calculated using mass balance approach: based on 215 g of fuel per kW-hr BSFC (from Arcadis) and 28,000 ppm sulfur

***** POLA: 33% of ships used one fuel for both propulsion and auxiliary (IFO-380, 28,000 ppm). POLB: Default fuel was assumed to be HFO (IFO-380, 28,000 ppm)

Default In-basin Electric

Power Emission Factors*

Emission Factor	POLB
NOx (g/kW-hr)	0.049
PM (g/kW-hr)	0.039
SOx (g/kW-hr)	0.003

* From AP42