AREA SOURCE EMISSIONS FOR CALENDAR YEAR 2023
METHODOLOGY DOCUMENTATION
AMMONIA FROM INDUSTRIAL REFRIGERATION

DESCRIPTION OF CATEGORY

This category estimates the emissions of NH3 from industrial refrigeration, which is assumed to be part of the food and agriculture industry. In previous inventories, this category was lumped into CES 47084 - Industrial Process Losses (Unspecified Material), corresponding to EIC=499-995-0000-0000 that belongs to major category 499 - Other Industrial. For clarity, this category is now migrated to Industrial Processes – Food and Agriculture – Ammonia, with EIC=420-995-2002-0000.

CES	EIC	Description
47084*	420-995-2002-0000	Industrial Processes – Food and Agriculture – Ammonia

*This category was originally included in Industrial Process Losses (Unspecified), which corresponded to EIC=499-995-0000-0000

METHODOLOGY AND ASSUMPTIONS

Ammonia is a widely used refrigerant in industrial refrigeration systems because it can be liquefied easily by compression or cooling and, when returned to its gaseous state, it absorbs large amounts of heat from its surroundings. Ammonia refrigeration systems are found in food, beverage, petrochemical, and cold storage industries. For example, the food processing industry operates with NH3 as the refrigerant because it provides cooling efficiencies that are approximately four times greater than chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) refrigerants (Hudson Tech, 2002).
Refrigerant losses can arise from one-time startup events, recurring operational or maintenance leaks, and equipment disposal. Earlier estimates were based on ammonia sales in our basin, based on surveys conducted for three major NH3 distributors in 1999.[1] Given that the survey data is over 25 years old, and no new data is available, this inventory uses a new approach based on the recommendation in EPA's report ammonia emissions estimation.[2] The calculation uses the number of employees in the food and beverage industry as a surrogate, and is as follows:

*Emission= Employees × Emission Factor (*EF*)*

Where:

- *Employees* refer to the number of employees in the sectors Food Manufacturing (NAICS 311XXX) and Beverage and Tobacco Product Manufacturing (NAICS 312XXX).
- *Emission factor* is 30 pounds per employee-year

[1] https://www.aqmd.gov/docs/default-source/rule-book/support-documents/rule-1127/final-1997-gridded-ammonia-emission-inventory-update-for-the-south-coast-air-basin.pdf
[2] https://www.epa.gov/sites/default/files/2015-08/documents/eiip_areasourcesnh3.pdf

Employment data shown in the table below is from the 2024 Regional Transportation Plan (RTP) developed by the Southern California Association of Governments.[3]

2023 Employment in the Food and Beverages industries in the South Coast Air Basin and the Coachella Valley (Riverside portion of the Salton Sea Basin)

Region	Food Manufacturing (NAICS 311XXX)	Beverage and Tobacco Product Manufacturing (NAICS 312XXX)	Total
Los Angeles	27,717	7,906	35,623
Orange	13,924	3,520	17,445
Riverside	2,386	2,317	4,703
San Bernardino	4,025	1,312	5,337
Total SCAB	48,052	15,055	63,108
Riverside (Salton Sea)	403	475	878

SUMMARY AND NEW EMISSIONS

Emissions of NH3 for base year 2023 for South Coast Air Basin and the Coachella Valley are presented in the table below.

Emissions of Ammonia from Industrial Refrigeration in 2023 in the South Coast Air Basin and the Coachella Valley

Region	NH3 Emissions (tpd)
Los Angeles	1.46
Orange	0.72
Riverside	0.19
San Bernardino	0.22
Total SCAB	2.59
Riverside (Salton Sea)	0.04

[3] https://scag.ca.gov/connect-socal