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SLT/NEI/TRI R&D Team Final Report and Recommendations

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1. BACKGROUND AND PURPOSE

The SLT-EI/NEI/TRI Research and Development (R&D) team was tasked to explore consistency and potential workflows for sharing emissions data between the Toxics Release Inventory (TRI), states' Emission Inventories (SLT-EI) and the National Emissions Inventory (NEI). Researching differences in emissions data across programs was identified by the Combined Air Emissions Reporting (CAER) leadership as a priority research area for the second phase of research and development teams. The SLT-EI/NEI/TRI team analyzed the data reported to the different systems; explored differences in emissions reporting with case studies; compared the calculation method codes and control measure treatment codes for TRI and NEI programs; investigated cross-program data quality processes; and made recommendations for the common emissions form. This project builds on the work conducted in the first phase of the R&D teams to identify differences in terminology and pollutants across the reporting programs, and to research how states and EPA use TRI data for NEI. The Phase I report is available at https://e-enterprisefortheenvironment.net/our-projects/combined-air-emissions-reporting-caer/ .

This report summarizes the results of our Phase II research. The specific analyses are organized as project deliverables, which are provided as appendixes to this report.

Contents

The Appendixes (project deliverables) are summarized below:

- **Description of the overlap within the SLT-EI/NEI/TRI universe** (Appendix A). This research identifies and quantifies the overlap among the NEI, SLT, and TRI reporting universes, reviewing the differences in the programs' reporting requirements, including the pollutant/chemical lists and industry sectors.
- **Comparison of the 2014 NEI and SLT-EI data to TRI emissions and analysis of differences** (Appendix B). The goal of this work was to determine the largest categorical differences in emissions with respect to industry types, pollutants, and states, and to help select criteria for case studies.
- **Case studies exploring differences in emissions reporting** (Appendix C): Case studies were developed with the states participating on the team (GA, MI, MN, SC) as well as the state of TX and EPA. The case studies aimed to further describe emissions differences and explain the reasons for these differences.
- **Comparison of the calculation method codes** (Appendix D) **and control measure treatment codes for both TRI and NEI programs** (Appendix E). This appendix describes overlaps in the emission calculation method codes and control/treatment codes in the NEI and TRI and provides crosswalks for these codes between these programs.
- **Cross-program data quality processes: survey results and recommendations** (Appendix F). This appendix describes how the different programs use each other's data as part of their data quality assurance (QA) and provides recommendations for improving cross-program data sharing.
- **Recommendations for the common emissions form** (Appendix G). The team identified recommendations for implementing the common emissions form, focusing on the form's user interface, back-end requirements, and overall workflow.

In addition to the findings and recommendations, several short-term wins were identified that are being implemented in the NEI, TRI and SLT-EI programs. For example, the 2017 NEI development approach will include loading the 2017 TRI data into the Emissions Inventory System (EIS) earlier than for previous cycles, allowing SLTs to use these data to QA their data with comparison tools available in EIS. This project has immediately resulted in greater coordination between the programs' QA efforts and familiarity with data and regulatory discrepancies, such as identifying certain TRI pollution control codes that may not be appropriate for a specific chemical and/or waste streams and resolving those potential data quality issues through regular QA processes. As a result, the team expects future QA efforts between the two programs to be even more effective and efficient.

2. METRICS: OVERARCHING FINDINGS

- The NEI includes more facilities than the TRI. The NEI includes data from approximately 88,000 facilities, 66,222 of which are stationary sources (e.g., not aircraft at airports). The TRI includes data from approximately 22,000 facilities.
- Approximately 64% of TRI facilities with emissions greater than zero are covered in the NEI. Approximately 15% of NEI facilities currently report to TRI.
- A significant portion of total TRI emissions mass for pollutants common to both programs is captured by TRI facilities contained in NEI. For the year 2014, the total TRI-reported emissions for TRI facilities contained in NEI account for 97% of total TRI emissions of overlapping pollutants.

- Comparing the NEI's SLT-reported emissions versus TRI emissions, the team found differences across states, industry type and pollutants. Of the 15,314 facility-pollutant pairs, covering 123 pollutants and 4594 facilities, it was found that almost half of the records were within 10%, and the median ratio of TRI/NEI emissions for most states was 1. There were more cases of TRI emissions larger than NEI. Out of a total 4,797 records where TRI and NEI emissions were comparable (i.e., within 2% of one another), approximately 27% had noticeable differences in how emissions were allocated to stack and fugitive releases.
- The NEI codes, which are called "emission calculation method" codes are much more numerous and detailed than the TRI codes, which are called "basis of estimate" codes: there are 23 NEI codes and 6 TRI codes.
- As of September 2018, EIS has 124 active control codes. The team found the EIS codes to be more detailed than the TRI codes. The TRI has 25 waste treatment codes, though some codes apply to waste streams other than air.
- There are a variety of QA approaches and priorities used by different reporting programs. There are few broad similarities between the programmatic offices and across the regions. However, we found that no programmatic office or regional office operates completely siloed from others.

3. FINDINGS AND RECOMMENDATIONS FROM DELIVERABLES

This section summarizes the findings and recommendations from each deliverable in Phase II. Details are provided in the Appendixes.

The key reasons for differences between NEI and TRI emissions are as follows:

- The NEI approach doesn't gap fill with TRI data if the SLT reports any of the facility's emissions for a pollutant, therefore if the SLT doesn't report all of the facility's emissions (for a pollutant), the NEI would have incomplete emissions for that pollutant.
- SLT reporting requirements/regulatory thresholds (including differences in facility definitions) differ from TRI – could result in NEI being higher or lower
- Pollutants are defined differently (e.g., glycol ethers)
- Some SLTs may not report non-routine emissions to the NEI such as accidental releases (and SLTs are not required to do so)
- Different emission factors may be used for TRI versus for SLT-EI's
- Different numerical values are allowed (discrete vs. range, significant digits)
- Reporting errors by facilities

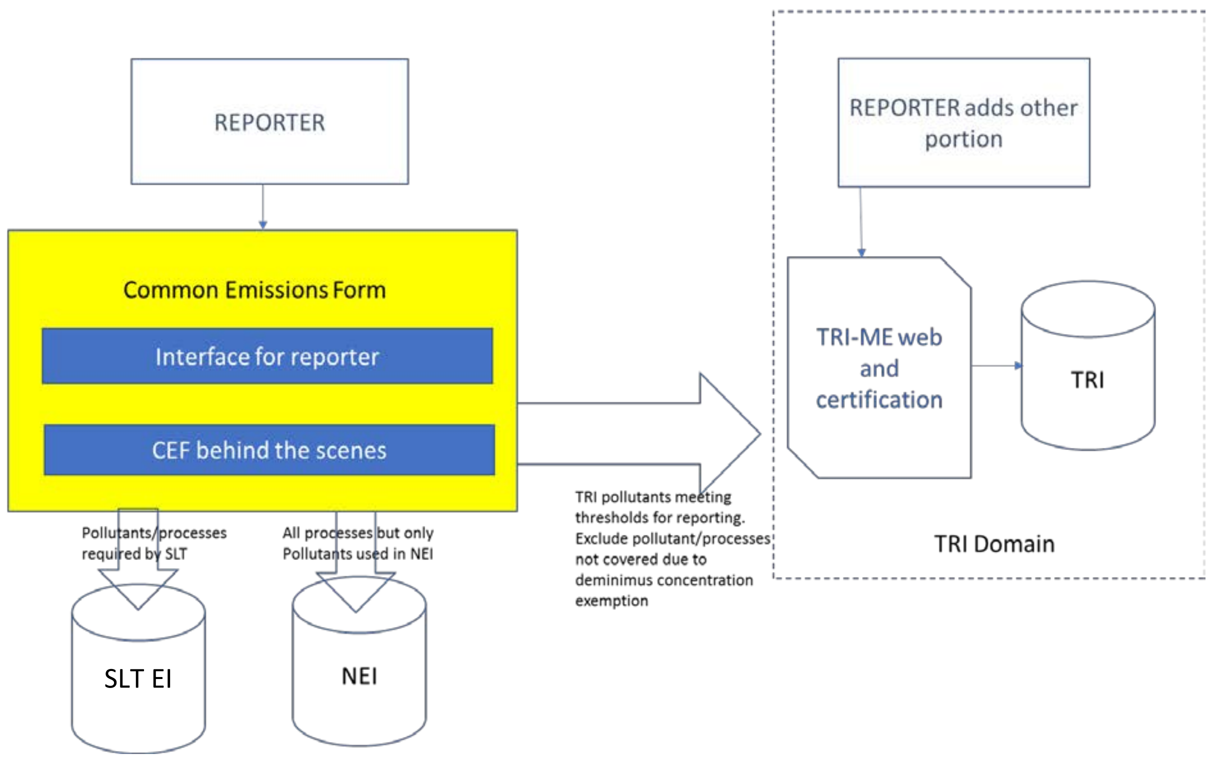
The recommendations included in this report should facilitate future discussions across the programs for potential changes in communications, updated guidance, and consistency in QA processes. High-level recommendations resulting from the research of this team fall into three categories:

a. Recommendations for the CAER Common Emissions Form (CEF)
b. Recommendations to help improve the way the programs use each other's data
c. Recommendations to existing programs

A. For the CAER Common Emissions Form (CEF)

The team recommends that initial efforts to develop the form should focus on the scenario in which the CEF is used directly by facility users to collect and QA data for SLT, NEI, and TRI programs (scenario 4 from Appendix G). This scenario offers the most benefits for reporters in terms of burden reduction and increased efficiency. In this scenario, the reporter uses the CEF to report and edit emissions to both SLT Emissions Inventories (EIs) and TRI. In addition to recommending scenario 4, the team also identified that there are additional workflow issues that will arise when a reporter needs to change or resubmit data that had been previously submitted with the CEF. Since the workflow for those situations has not been devised yet to date, the team did not include those considerations in the recommendations for the CEF.

Figure 1. The potential workflow of the CEF for which the team provided recommendations. Here, the CEF is populated by the facility reporter and then used to populate data for SLT EIs, NEI, and TRI forms.



The CEF should:

1. Have an interface for facility reporters.
2. Incorporate requirements of the different air reporting programs, such as emission reporting thresholds and exemptions.
3. Be able to push data to the different air reporting programs in the format required by each of these programs. This includes air emissions data and control/treatment information.
4. Provide quality assurance of submitted data.
5. Accommodate state-specific requirements such as SLT fees.
6. Make reporting as easy as possible by incorporating automated QA for reported data (e.g., preventing reports from being submitted which have required data fields omitted) and providing specific field

information (e.g., relevant guidance or regulatory definitions appearing in pop-up windows) to ensure correct reporting. In addition, the CEF could incorporate a "code finder" based on set of questions/key words, to facilitate reporting.

7. Provide a technical guidance document that reporters can consult before filling out the CEF, to ensure more representative estimation of actual emissions for SLT and federal reporting programs. The CEF could also include links to the latest program guidance documents.
8. Link to previously-reported data wherever possible, for the facility's reference. Ideally the CEF could pull data from the facility's most recent TRI submission (when applicable) and allow the reporter to select the previous data to pre-populate, if desired.
9. Include clear definitions of pollutants, particularly for those pollutants or pollutant groups that overlap but aren't exact matches across SLT EIs/NEI and TRI. Some are treated differently by different programs (e.g. certain glycol ethers and cyanide compounds), and the CEF needs to address that. Specific pollutant considerations are detailed in Appendix G. Additionally, for these chemicals or chemical categories that are defined and reported differently between the TRI and NEI programs, the CEF should be able to report the appropriate quantity of a pollutant to the respective reporting programs.
10. Be able to perform complex calculations that go beyond simple emission factors calculations. The CEF will need to be able to perform or provide guidance on emission calculations that are not as simple as using emission factors; examples can be found in Appendix G under the "Back-end Calculations and Functions" section. Some procedures that have been developed by SLT or industry trade associations may need to be compiled and made available.
11. Include crosswalks for program data elements and provide reporters with a list of options (e.g., through drop-down menus) to facilitate reporting across programs since some reporting data elements do not overlap perfectly across the federal air emissions programs. For example, if the reporter chooses to report using the SLT/NEI control measure field, the form would provide the TRI waste treatment code that best matches the SLT/NEI. Specific recommendations are documented in Appendix D and Appendix E.
12. Be able to communicate with other programs and identify when updates are made to program requirements in order to update the CEF system with the latest information. For example, emission factors are sometimes updated and the CEF should include the most up-to-date emission factors.
13. Be able to incorporate further program information from across states and federal programs. Other additional SLT codes can be added to the CEF moving forward as the CAER team becomes aware of them.
14. Provide report summaries and/or submission receipts for facilities to save for their own records.

B. For improving how the programs use each other's data

1. Program offices may consider using TRI as a good information source for QA of the SLT EIs and NEI, and vice versa. More information should be provided to both EPA and SLT staff and facilities about NEI/TRI comparisons and the limitations of such comparisons.
2. Program offices may consider improving their approach for comparing NEI/TRI data by developing and sharing best practices for comparing the data across programs.
3. Increased efforts and awareness for education, outreach, and technical guidance are necessary to increase the capability for reporting facilities to estimate more accurate emissions to both SLT EIs and TRI.

4. Development and maintenance of an EIS facility ID-TRIFID crosswalk needs to be handled by an automated database. This automation would include tasks such as tracking facility merges (across both systems), mapping to new IDs, and changes including mergers or sub-entity transformations. We have been made aware that this effort is already planned under a facility team of E-Enterprise.
5. More coordination across TRI, NEI and SLT staff will improve scheduling efficiency for products and upcoming data quality activities.
6. Maintenance of up-to-date programs that are the bases of emission reporting for SLTs (e.g., WebFIRE and AP-42) will be needed.

C. For existing programs

1. TRI and NEI control codes and pollutant codes should be managed in a centralized location such as Synaptica.
2. Consider developing a new set of fewer emission estimation codes for the NEI. This includes determining if there needs to be a distinction between literature, trade association, vendor/manufacturer, and other emission factor codes in the NEI. Similarly, staff would need to decide whether there also needs to be a distinction for control efficiency codes. Detailed recommendations are covered in Appendix D.
3. Additional guidance and examples need to be provided on the basis of estimate codes in both the NEI and TRI programs. Detailed recommendations are covered in Appendix D.
4. Clearly explain the interpretation of any new codes before they are added to federal programs (TRI and NEI).
5. For annual TRI data quality reviews, update and continue use of an "expected pollutants" list based on industry.
6. When TRI data are used in the NEI, NEI will have to assign some default parameters (e.g., stack height, stack temperature) due to differences in reported data elements for TRI. In the long-term, having more precise and facility-specific parameters assigned to these facilities' NEI data would improve the data quality.
7. To help prevent any incomplete data from being submitted to the NEI, states may want to consider reviewing TRI emissions estimates for their facilities to inform their reporting. For example, SLT may find the TRI data for a particular pollutant to be more complete and thus choose not to report for that pollutant, since the NEI will use TRI for gap filling for facilities where there are no reported SLT emissions for that pollutant.

4. SHORT TERM WINS

During the project, the SLT and EPA team members continually developed suggestions for improving current NEI and TRI data and QA procedures in the short term, before the CEF is implemented. SLT team members also made contributions to improve their own inventory programs.

Improvements implemented or planned in the short-term are:

- Understanding that the data provided by SLT may not be complete across the whole facility and that TRI may provide a more accurate total emissions value for the facility when SLT data is not complete. Starting with the 2017 NEI cycle, the NEI team plans to encourage SLT to compare TRI emissions with SLT emissions values as part of their data quality reviews.
- Helping facilities understand possible reasons for NEI and TRI differences during data quality calls.

- Planning to improve the way TRI is used in NEI by utilizing the crosswalk of the TRI basis of estimate code data element to NEI's method codes instead of assigning "engineering judgment" as the placeholder method code to all data pulled from TRI.
- Planning to look into treatment code data reported for TRI air waste streams that may not be applicable to air releases.
- Loading TRI data into EIS earlier in the NEI development cycle, so that SLT are able to use EIS comparison tools for their data quality reviews.
- Adding a new polycyclic aromatic compounds (PACs) pollutant group to EIS, so that TRI data for PACs can be used in the NEI for gap filling purposes, without having to change it to NEI pollutant "total PAHs" (thus maintaining the integrity of the TRI data).
- Creating automated procedures to prevent double-counting of overlapping pollutants across reporting programs. (This was successfully developed within NEI over the course of this project.)
- Increasing coordination and data sharing across SLT, TRI staff, and facilities for data quality efforts within TRI.
- Investigating treatment codes reported for air waste streams that do not appear to be applicable to air emissions as part of the TRI data quality reviews.

5. SUMMARIES OF ANALYSES

A. Overview of the Overlap of NEI/TRI/SLT-EI Reporting Universes *[Appendix A]*

The objective of this effort was to identify the overlap among the NEI, SLT, and TRI reporting universes in order to estimate the benefits of relating NEI and TRI reporting data. This section summarizes the findings contained in Appendix A.

- The number of NEI facilities is larger than the number in TRI: in 2014 NEI estimated emissions for approximately 86,000 facilities (including airports and rail yards) and 66,000 stationary source facilities—61,000 of which have emission estimates supplied by SLTs. Of the 66,000 stationary facilities in the NEI, about 43,000 facilities report at least one pollutant also covered by TRI.

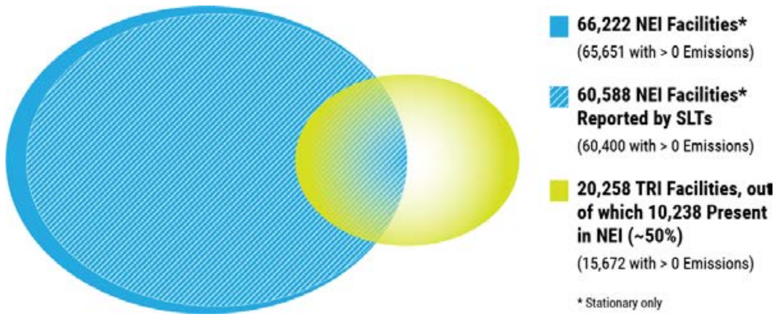


Figure 2. Diagram of the facility overlap of the reporting universes for the TRI and NEI programs, including details on how many of those facilities reported above-zero emissions.

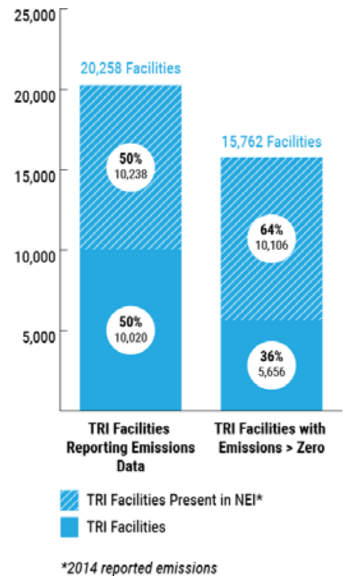


Figure 3. Proportion of TRI facilities which are also in the NEI, including details on how many of those facilities reported above-zero emissions.

- In 2014, 20,258 TRI facilities reported air emissions data (emissions reported as greater than or equal to zero). The team found that at least 10,238 of those facilities are also present in the 2014 NEI; this represents about half of the total TRI facilities who reported emissions data in 2014 (left bar).
- Of the 20,258 TRI facilities with reported emissions data in 2014, about 4,500 reported emissions of zero, therefore 15,762 TRI facilities had greater than zero emissions. Of the 10,238 TRI facilities present in the NEI, 10,106 facilities have emissions greater than zero. Considering only the subsets of facilities with emissions data greater than zero, 64% (10,106 out of 15,762) of those 2014 TRI facilities were also in the 2014 NEI (right bar).
- Of the 10,238 facilities found to be both in the 2014 NEI and 2014 TRI, 6,550 facilities had at least one pollutant reported by SLT to the NEI. This is possibly the number of facilities that report to both SLT and TRI (but it is possible that SLT estimates emissions for some and reports their estimates to the NEI).
- The TRI facilities that can be matched to NEI facilities capture a significant portion of total TRI emissions for pollutants common to both programs. The R&D team found that, in the 2014 EIS, 9,714 facilities reported emissions of at least one common pollutant/chemical to both NEI and TRI. Total TRI-reported emissions associated with the 9,714 facilities accounted for 97% of total TRI emissions of NEI pollutants (excluding hydrogen sulfide, which is neither a CAP nor HAP). Most of the chemicals on both programs' lists had 90% or more of their reported release masses captured by matched facilities; 52 chemicals had 100% matches in reported release masses.
- While 10,238 of 66,222 NEI stationary facilities were also found in TRI, nearly 24,000 NEI facilities are estimated to be in both a TRI-covered industry sector and report at least one TRI-covered pollutant/chemical. Some of the 24,000 NEI facilities may not meet TRI chemical thresholds or employee numbers.
- The full scope of mutually-covered NAICS sectors between TRI and the NEI was difficult to estimate precisely due to various exemptions and limitations to several of the NAICS codes covered by TRI. In the 2014 NEI, 928 NAICS codes were reported at the six-digit (most granular) level, out of a total 1,283 NAICS codes reported (others were reported at a higher-level and could not be narrowed down). Of those 928 six-digit codes, the team found that 389 (42%) potentially fell within the scope of TRI reporting requirements.

There are numerous reasons that the NEI and TRI universes are different. The definitions of "facility" in the NEI and TRI programs can be different, based on the programs' respective statutory and regulatory language. For example, the NEI includes facilities that are not stationary sources, which TRI does not. The NEI also includes several industry categories not covered by TRI reporting. The different reporting programs also have different reporting thresholds and requirements. Thus, not all facilities in TRI would also be represented in the NEI, and vice versa. Matching TRI to NEI facilities is difficult due to facility differences. In addition, the TRI program allows for the reporting of multi-establishment facilities by individual establishment under a single TRI facility identification number which further impacts the ability to match between the data in these programs' databases.

B. Comparison of NEI emissions reported by SLT with TRI emissions [*Appendix B*]

The objective of this work was to compare NEI and TRI emissions by pollutant and determine the largest categorical differences in emissions with respect to industry types, pollutants, and states, and help select criteria for case studies. The work described here includes only the TRI air emissions; emissions to other media were not included.

This section summarizes the findings contained in Appendix B.

- Figure 4 shows the distribution of the TRI/SLT emissions ratios based on the 2014 reporting year. Only facility-pollutant records with both SLT and TRI data were explored. First, we looked at situations in which SLT emissions were zero and TRI emissions were greater than zero. This occurred in only 1% of facility-pollutant combinations (215 out of 15,314), and it was found that most of the records were likely due to rounding of low values to 0 lbs. We next looked at records where both TRI and SLT were zero. Of the nearly 15,000 observations compared, we found about 45% were within 10% (i.e., TRI:SLT emissions ratio between 0.9 and 1.1).

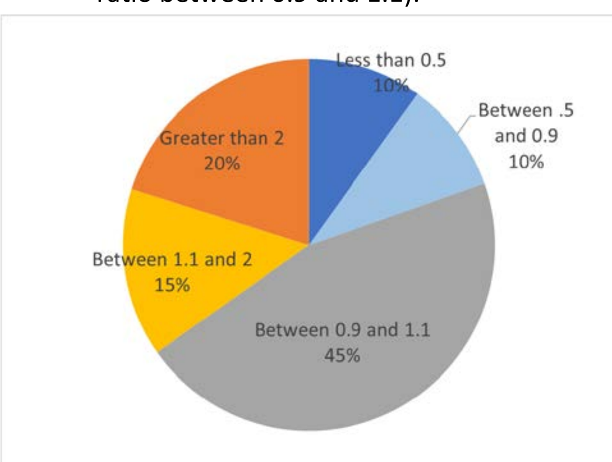


Figure 4. Proportion of ratios of TRI:SLT emissions reported, among all facilities reporting to both TRI and NEI (reporting year 2014).

- Figure 5 shows the distribution of the TRI/SLT emissions ratios **by state.**

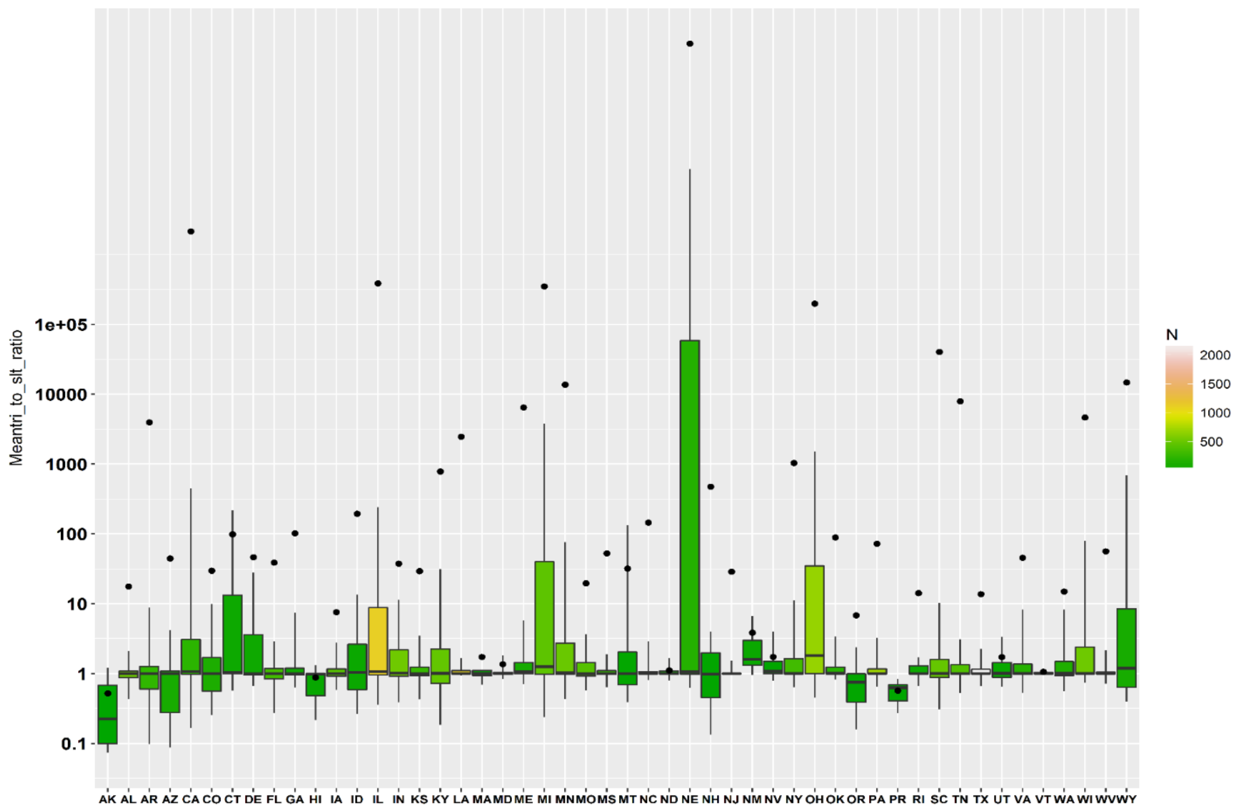


Figure 5. Distribution of TRI:SLT emissions ratios, for each state (reporting year 2014).

- Comparing the SLT-reported NEI emissions to TRI emissions, the team found differences across states, industry type and pollutants. Most, but not all, states had a median ratio close to one.
- Out of a total of 4,797 records with total comparable emissions, there were 1,300 records (approximately 27%) that were flagged as having noticeable differences between the two data sets when looking at emissions allocations to stack and fugitive releases.
- In comparing pollutants, it was necessary to sum up pollutants belonging to pollutant groups to avoid mis-calculating or double counting. A table of pollutant groups used in NEI and TRI comparisons is available in the full deliverable (see Appendix B).
- TRI allows emissions to be reported by establishment, not only by entire facility, yet there is no double counting (even though there may be more than one chemical record per facility identification). Ideally, for purposes of comparing NEI and TRI, the TRI would include an additional establishment identifier.

C. Overview of the Project Case Studies *[Appendix C]*

This section provides a brief overview of the information found in the development of the case studies that were conducted with the states participating on the team (MN, MI, SC, and GA) and EPA. Texas also provided case studies and reviewed the case study findings and recommendations. The case studies aimed to further describe emissions differences and explain the reasons for these differences.

- TRI is a good resource for the QA of the SLT EIs and NEI, and vice versa.
- SLT data may be more precise than TRI in some instances but not all. For NEI gap filling, it may not be appropriate to assume that state submitted HAPs or air toxics data should supersede the TRI reported values, especially since HAPs reporting by facilities is not mandatory in many SLTs. Those SLTs may use

available published emission factors to include HAPs in their inventories, rather than use industry-supplied data.

- For NEI gap filling, it may be better to use TRI than the 2010-MATS Emission Factors for EGU HAP estimates because the facility may have changed its configuration and/or added emissions controls since the 2010 testing.
- WebFIRE and AP-42 are one of the sources of emission factors for SLT emission inventories. They should be kept up to date by the EPA.
- Education, outreach, and technical guidance are necessary to increase the facility awareness and capability of estimating more representatively actual emissions for both SLT EIs and TRI.
- Clear definitions of pollutants are needed, particularly for those pollutants not easily crosswalked between SLT EIs/NEI and TRI. The pollutant crosswalk in Phase I of this project identified those pollutants. The future CEF should have more explicitly defined pollutants. For example, a reporter should be able to distinguish “cynanide compounds” for which hydrogen cyanide is included from “cyanide compounds” from which hydrogen cyanide is excluded.

D. Cross walks of NEI and TRI estimation method codes [*Appendix D*]

A data element common to both NEI and TRI is the method of estimation. Emission estimation method codes provide broad information to users on how the estimate was made. These codes may be used to characterize the quality of the data; however, it is difficult to determine the relative ranking of some methods over others, particularly when looking at different sources of emission factors, speciation, and engineering judgement. For both NEI and TRI, this element is populated based on a distinct set of allowable codes. These codes differ between NEI and TRI, and the purpose of this deliverable was to create a codes cross walk. The crosswalk consists of two tables: NEI-to-TRI and TRI-to-NEI provided at the end of the appendices. High level recommendations on the use and potential changes to the codes are presented below.

- The NEI codes, which are called “emission calculation method” codes are much more numerous and detailed than the TRI codes, which are called “basis of estimate” codes: there are 23 NEI codes and 6 TRI codes.
- Many codes are not easily mapped 1-to-1 so a “best fit” determination was developed. Some of the codes were not clear, and the team had different interpretations of the codes and inherent quality. The team also found that some states have their own codes which could differ from NEI codes.
- The NEI includes separate codes to distinguish between an estimate based on (a) an emission factor with a percent control adjustment and (b) an emission factor developed based on testing of controlled emissions. The largest difference between the NEI and TRI approaches to codes was that TRI does not have such a distinction.
- Additional guidance and examples need to be provided on the codes in both NEI and TRI programs for data reporters (e.g., enhanced descriptions in the NEI code tables in the Emissions Inventory System).

E. Cross walks of NEI and TRI control codes [*Appendix E*]

Control codes and waste treatment codes are data elements in the NEI and TRI that allow data users to determine how facilities reduce or prevent releases of the chemicals or pollutants being used or created by the facility. These codes differ between NEI and TRI, and the purpose of this deliverable was to create a control codes cross walk. The crosswalks are in tables at the end of ***Appendix E***; findings and recommendations for the CEF are presented below.

- As of September 2018, the EIS has 124 active control codes for use by SLTs. The TRI has 25 waste treatment codes, though some are for releases other than air. We found the EIS codes to be more detailed than the TRI codes. We provided for each NEI control code a best fit TRI code. It was not possible to identify a best fit NEI code for all TRI codes, because some TRI waste treatment measures are too general (e.g., scrubber) and others appeared to be not applicable to air streams (even though they may have been reported for them).
- If the reporter chooses to report using the TRI waste treatment codes, the CEF would provide list of SLT/NEI control codes via a drop-down menu that shows the NEI control measure options associated with the TRI waste treatment option.
- If the reporter chooses to report using the SLT/NEI control measure field, the CEF would provide the waste treatment code that best matches the SLT/NEI.
- Additional guidance and examples need to be provided on the codes in both NEI and TRI programs for data reporters (e.g., enhanced descriptions in the NEI code tables in the Emissions Inventory System).

Additional recommendations are documented in Appendix E.

F. Cross-program Data Quality Processes: Data Quality Process Survey and Survey Results and Recommendations [***Appendix F***]

This phase of the project examined how the TRI and NEI programs used each other's data and other program data for QA. The R&D team distributed a survey to staff overseeing and participating in data quality efforts with the TRI and NEI programs and to several EPA regional offices across the country. This survey helped inform the SLT/NEI/TRI team's report on recommendations for cross-program data sharing and QA calls as part of the CAER program.

The survey's questions focused on the programs' and regions' QA processes and timelines, any emissions data used from other programs for QA, how staff determines which facilities require follow-up, and how staff interprets or handles any significant data discrepancies across programs. Six survey responses were received from EPA staff in the NEI and TRI programs and within regional offices: one was from the TRI program, two from the NEI programs, and three from regional programs. (For the full list of questions and the compilation of survey responses, see Appendix F).

Findings from this survey reflect a variety of QA approaches and priorities; there are few broad similarities between the programmatic offices and across the regions. Programmatic offices and regional offices each have their own QA processes and priorities related to data quality and potential enforcement concerns. One commonality across all survey responses was that no programmatic office or regional office operates completely siloed from others. Each respondent, even those who may not compare NEI and TRI data for QA, still rely in part on input and direction from other offices.

Overall, respondents also varied in their support for comparing TRI and NEI data for QA, with some staff regularly using the cross-program comparisons, and other staff pointing out the regulatory and reporting differences between the programs as bases for not utilizing the NEI/TRI comparisons for QA.

Although the R&D team did not distribute this survey to SLT agencies, the team received feedback from state representatives with CAER that either use TRI data for their state data purposes or comment on the process. Insights from these state representatives, including a general information document from one state that has developed internal guidance for considerations when comparing TRI and state emissions inventory data, were included in the R&D team's findings and recommendations on QA processes.

Key recommendations from this investigation are to:

- develop informal information documents to assist those using cross program data for QA,
- development of an automated TRI to EIS ID crosswalk and keep it up to date, and
- include emission factor/estimation approaches from industry research groups/ trade organizations in the emission factor compendium (as these are utilized by facility reporters particularly in the power and pulp and paper industries).

The full list of recommendations is here.

G. Recommendations for the common emissions form (*Appendix G*)

The recommendations for the CEF were developed from the research described above. In addition, we gathered emissions-related data elements in TRI and determined how to populate them from the data expected to be reported in the CEF for the scenario in which a reporter uses the CEF to fulfill its SLT-EI and TRI air reporting requirements. The high-level recommendations on the requirements for the CEF are included in Section 3 of this report. Details are in Appendix G.

6. APPENDIXES – FULL DELIVERABLES

APPENDIX A: Analysis of Overlap of NEI/TRI/SLT Reporting Universes

Analysis of Overlap of NEI/TRI/SLT Reporting Universes based on Defined Metrics

Purpose of this Deliverable

Phase II of the CAER SLT(State/Local/Tribal)/NEI (National Emissions Inventory)/TRI (Toxics Release Inventory) R&D project aims to explore overlaps and differences in emissions data reporting between SLT/NEI and TRI and identify opportunities to enhance data sharing amongst programs. In Phase 1, the project team documented the overlap in NEI and TRI pollutants and found that while there is a great deal of overlap, there are some discrepancies. To gauge the benefits of relating TRI and NEI reporting and data, *the team first needs to identify the overlap of the programs' reporting universes.*

This paper identifies and quantifies the overlap among the NEI, SLT, and TRI reporting universes, based on three categories of metrics. The metrics consider the differences in the programs' reporting requirements, including the pollutant/chemical lists and industry sectors.

Background on SLT/NEI/TRI Program Reporting

TRI collects data from facilities with at least 10 full-time employees (or equivalent) from specific industry sectors (such as manufacturing, hazardous waste, electric utilities, and mining), who manufacture, process, or otherwise use a TRI-listed chemical over the threshold quantity. Facilities report first to EPA, then to their respective state or tribe. Each year, approximately 22,000 facilities report to TRI. Federally-owned facilities also report to TRI, regardless of industry sector. TRI facilities are stationary sources.

NEI collects facility emissions of criteria air pollutants, hazardous air pollutants (HAPs), and a few other pollutants. These data are primarily submitted by SLTs to EPA, though some are estimated by EPA (including the use of data from TRI). Facilities do not report directly to NEI; they are present in the NEI because SLTs report them, or the NEI uses TRI data or other EPA-generated data for gap-filling. Criteria pollutants have thresholds at which SLTs must report, but HAPs are reported voluntarily, and SLTs may submit HAPs data below NEI thresholds. There are no restrictions (or requirements) for the type of facilities submitted—some SLTs submit data for very small establishments such as gas stations and dry cleaners. In addition to facilities located at stationary locations, NEI also includes facilities that are not stationary sources (such as airports and rail yards). The number of NEI facilities is larger than the number in TRI: in 2014 NEI estimated emissions for approximately 86,000 facilities (including airports and rail yards) and 66,000 stationary source facilities—61,000 of which have emission estimates supplied by SLTs.

Metrics & Approach

The team examined NEI and TRI emissions data from 2014 based on the following metrics:

1. **Reporting facilities**: This metric was used to address both the proportion of all NEI facilities that also report to TRI, and the proportion of TRI facilities also reporting to NEI.
2. **Pollutants/chemical releases**: While NEI pollutant and TRI chemical lists have many overlaps, they are not identical. This metric was used to identify the amount of TRI emissions captured by NEI reporting as well.

3. **NAICS codes**: Because NEI does not have any restrictions related to facilities' NAICS (North American Industry Classification System) codes, this metric focused on the number and percent of NAICS codes covered by TRI that are also present in the NEI.

Two versions of TRI data for the reporting year 2014 were used for this analysis: data downloaded in February 2016 (the same data used for building the NEI), and data downloaded in February 2018.

To determine the number of NEI facilities reporting to TRI, the team used a January 2018 version of the crosswalk of EIS-IDs to TRI Facility Identification Numbers (TRIFIDs) that is maintained in the Emissions Inventory System (EIS). In the EIS system, only one *active* TRIFID can be assigned (or matched) to an EIS facility. However, more than one TRIFID can be assigned if an end-date has been specified in EIS (thereby making the earlier "match" inactive). TRIFID assignments are independent of the inventory year.

1. Analysis based on Reporting Facilities Metrics

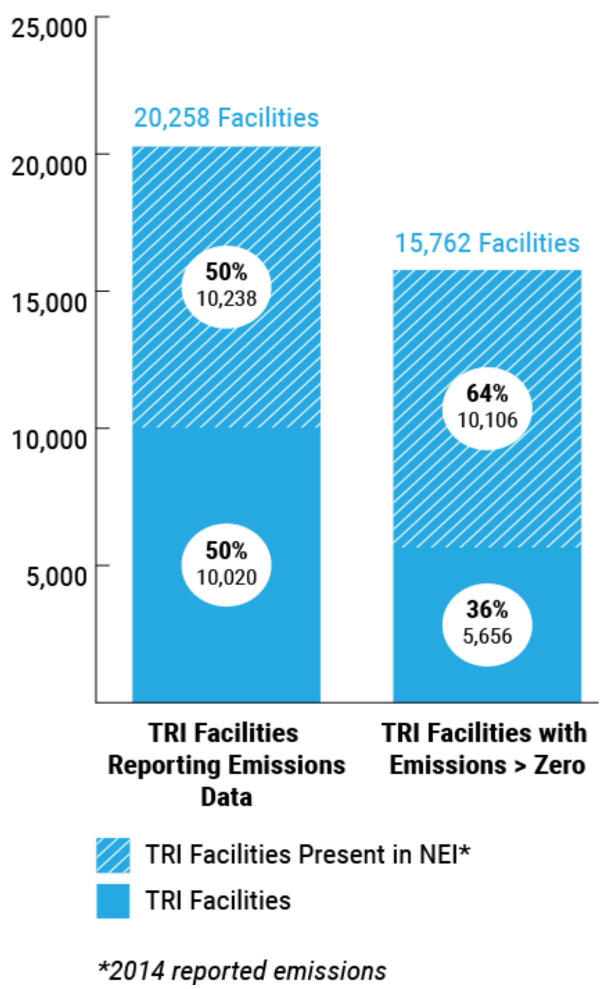
TRI facilities reporting to NEI

In 2014, 20,258 TRI facilities reported air emissions data (emissions reported as greater than or equal to zero). The team found that at least 10,238 of those facilities are also present in the 2014 NEI; this represents about half of the total TRI facilities who reported emissions data in 2014 *(Figure 1, left bar)*.

It should be noted that of the 20,258 TRI facilities with reported emissions data in 2014, about 4,500 reported emissions of zero, therefore 15,762 TRI facilities had greater than zero emissions. Of the 10,238 TRI facilities present in the NEI, 10,106 facilities have emissions greater than zero. Considering only the subsets of facilities with emissions data greater than zero, 64% (10,106 out of 15,762) of those 2014 TRI facilities were also in the 2014 NEI *(Figure 1, right bar)*.

Of the 10,238 facilities found to be both in the 2014 NEI and 2014 TRI, 6,550 facilities had at least one pollutant reported by SLT to the NEI. These are possibly the facilities that report to both SLT and TRI (but it is possible that SLT estimates emissions for some of these and reports them to the NEI). The NEI does not indicate if the SLT-reported data are due to facilities reporting to SLT versus SLT estimating their facility's emissions, but we expect most SLT reported data to be from facilities reporting to SLT.

Figure 1. TRI Facilities Covered in NEI



The team also looked at facilities which reported at least one common pollutant to both TRI and the NEI, which included approximately 9,714 facilities. There were also 6,534 TRI facilities for which at least one pollutant was used in the NEI for gap-filling. In other words, roughly 10% of the NEI stationary source facilities used TRI data for at least one pollutant.

Methodology used for these calculations and observations:

- **The number of NEI facilities reporting to TRI was based on the crosswalk of EIS ID to TRI ID (one-to-one matches).** The team determined the number of one-to-one matches in the crosswalk that have both TRI emissions and NEI emissions of any pollutant. There are at least 10,238 facilities that have one-to-one matches between TRI and NEI and that have emissions in both TRI and in the NEI. Based on some matching notes provided by the EPA's point source lead developer, there are at least 45 facilities that have many-to-many matches that are not included in this matching file. Thus, 10,238 is a lower bound of the number of TRI facilities that are in the NEI.

- **The team counted only the one-to-one facility matches, but it is likely there are more facilities in EIS reporting to TRI than currently matched in this analysis**. There are many situations in which there are multiple TRI facilities listed for a single EIS facility or vice versa because the definition of facility is different, and TRI allows the reporting of multi-establishments. The team does not have an estimate of these. In addition, matches may be missing from EIS. NEI focuses on the largest emissions when creating or updating matches.

- **The number of NEI facilities with common pollutants was based on the number of TRI facilities with emissions reported in 2014 that were loaded into EIS, which is the system used to create the NEI: 9,714 facilities.** Of the 9,714 facilities, emissions for at least one pollutant from 6,534 were used for gap-filling the NEI. The reason that not all 10,238 facilities in the TRI that match the NEI were loaded into the EIS is that the pollutants at these facilities may not match to an NEI pollutant. For example, if the TRI facility emitted only glycol ethers, it may match to a facility in NEI (thus included in the 10,238) but would not have been loaded into EIS because the TRI glycol ethers list includes butyl cellosolve, which is not a Clean Air Act HAP (it was delisted).

NEI facilities reporting to TRI

Based on the above analysis, the team established that at least 10,238 NEI facilities are in TRI, though due to the many-to-many relationships, there may be 45 or so more. The NEI has a very large number of facilities at stationary locations (66,222) due to both the required reporting (by SLTs) of facilities that emit criteria pollutants which are not covered by TRI, and the voluntary reporting (by SLTs) of facilities that are not included in TRI, such as some off-shore oil and gas facilities (1,651), asphalt plants (1,399), gas stations, on-shore oil and gas related facilities and compressor stations, and many other non-covered NAICS. **Considering all NEI facilities, 10,238 out of 66,222 NEI stationary facilities (15%) also report to TRI.**

Not all NEI facilities have pollutants or are in NAICS codes that are also covered by TRI. Out of the 66,222 NEI stationary facilities, 43,402 facilities have at least one pollutant that is covered in TRI. However, it is more difficult to determine the overlaps in NAICS code coverage. Because NEI has allowed 3, 4, and 5-digit NAICS, and because some of TRI's NAICS have additional criteria/exceptions for determining coverage by TRI, it is difficult to quantify the NEI NAICS facilities with overlapping TRI NAICS. The team found, via development of an approximate crosswalk, that there are about 24,000 NEI facilities that have at least one common pollutant *and* are in a NAICS code also covered by the TRI program. Thus, the 10,238 represents almost half of the potentially TRI-covered NEI facilities (based on pollutant and NAICS).

Figure 2 shows an overview of the number of facilities in these programs and their overlap.

Figure 2. Approximate Overlap in Stationary Facilities Reporting Air Emissions to NEI and TRI for 2014

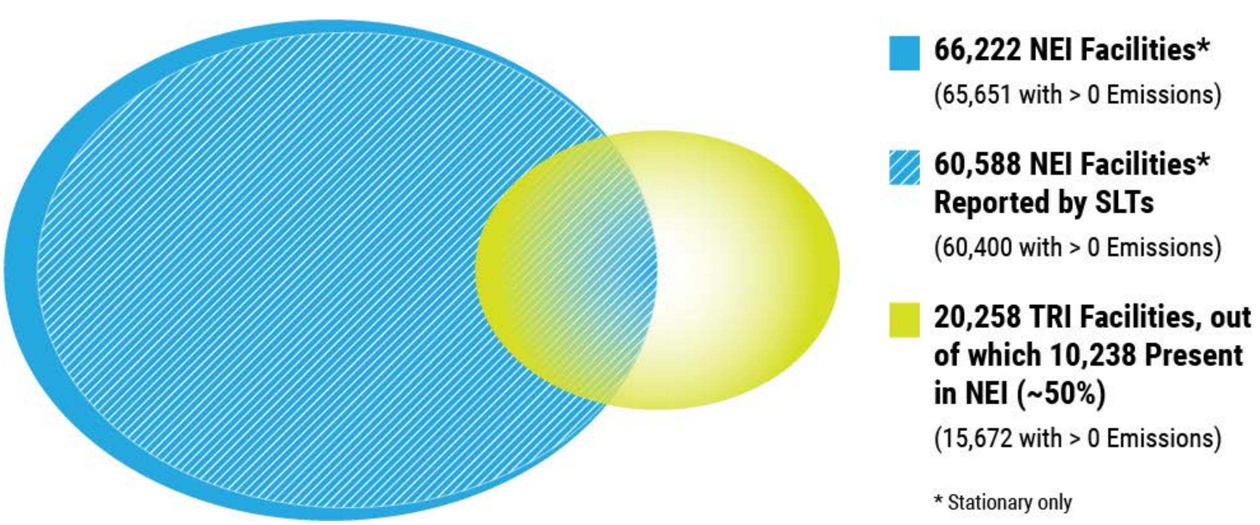


Figure 2 - Background: At least 10,238 TRI facilities with 2014 reported emissions data (emissions greater than or equal to zero) are present in the 2014 NEI. Given that there are 20,258 total TRI facilities with 2014 reported emissions data (greater than or equal to zero), this represents about half of those TRI facilities.

Figure 3. Approximate Overlap of NEI and TRI Pollutants, and NAICS Codes Covered by the TRI Program Only

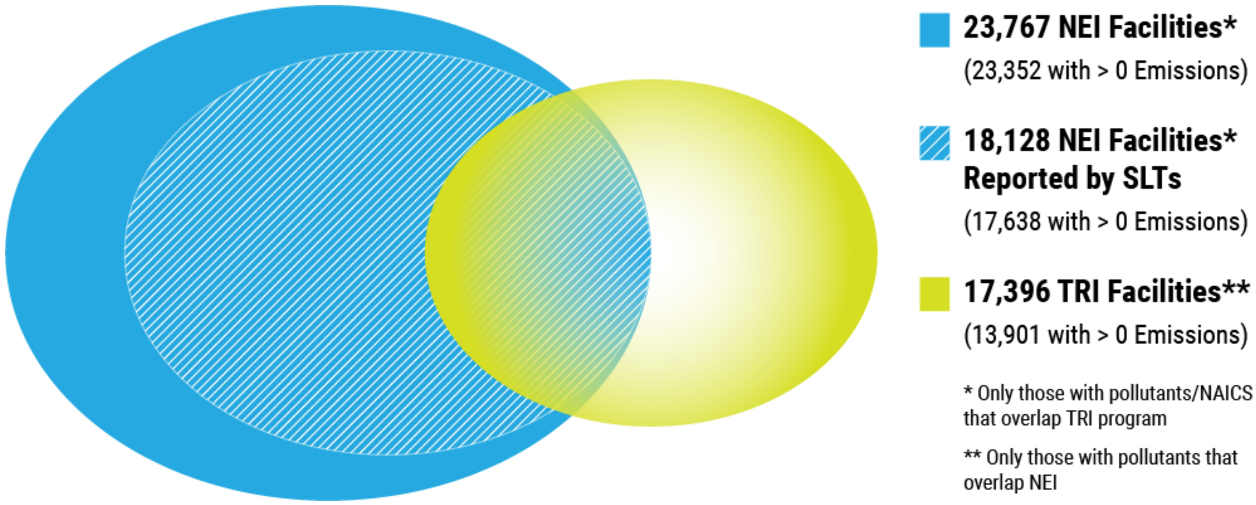


Figure 3 - Background: There are about 24,000 NEI facilities that have at least one common pollutant and NAICS code with the TRI program. Thus, the 10,238 represents almost half of the potentially TRI-covered NEI facilities (based on pollutant and NAICS). Looking at the universe of the programs' overlapping pollutants/chemicals and TRI-covered NAICS codes, the team found a much larger overlap between NEI and TRI facilities.

Methodology used for these calculations and observations:

- Of the 20,258 TRI facilities with reported air emissions data in 2014, 15,762 have emissions greater than zero. For the NEI there are 65,651 stationary facilities with emissions greater than zero.

- Looking at the universe of the programs' overlapping pollutants/chemicals and only NAICS codes covered by the TRI program (thus, limiting the scope of the analysis to those facilities that may be within the TRI reporting thresholds), **the team found a much larger overlap between NEI and TRI facilities.**

- For the 2014 NEI, the team loaded 9,714 TRI facilities with non-zero emissions of at least one NEI pollutant that were matched to NEI facilities. In other words, more than half of all TRI facilities reporting greater than zero emissions of at least one NEI pollutant were incorporated into EIS. Of these, 6,316 facilities were used to gap-fill at least one NEI pollutant in the 2014 NEI.

2. Analysis based on Pollutants/Chemical Releases Metrics

TRI emissions also reported to the NEI
Total TRI reported emissions associated with the 9,714 facilities added to EIS (mentioned above) account for 97% of total TRI emissions of NEI pollutants, excluding hydrogen sulfide which is included in the NEI but is neither a CAP nor HAP.

The team computed the amount of TRI chemical releases by facilities that were matched to NEI facilities and compared to the amount released by all TRI facilities. The TRI facilities that are matched to the NEI were loaded into EIS for potential use in the NEI when SLTs did not report emissions. Because this analysis loaded only the matching facilities, the team wanted to better understand what fraction of the total TRI was loaded. In other words, while just 50% of TRI facilities were matched to NEI facilities, this metric analyzed what proportion of TRI emissions this comprised. This analysis was done by pollutant and utilized the same downloaded version of TRI data that the team used for the NEI (downloaded February 2016).

Table 1 summarizes the percent of TRI emissions by pollutant that matched to EIS facilities that have non-zero NEI emissions. Attachment 1 lists the total TRI release quantity and ratio of TRI to NEI emissions. These pollutant emissions would only be used if not already submitted by SLTs. The cyanides (i.e., CN and HCN) were summed because the HCN from TRI was used as CN. Also, the xylenes and cresols and PAHs were summed.

Table 1. Summary of reported 2014 emissions overlaps between the NEI and TRI.

Pollutants with 100% of total TRI mass captured by matched facilities
1,1-Dimethyl Hydrazine; 1,2,3,4,5,6-Hexachlorocyclohexane; 1,2-Diphenylhydrazine; 1,2-Epoxybutane;1,2-Propylenimine;1,3-Propanesultone; 1,4-Dichlorobenzene;2,4,5-Trichlorophenol;2,4,6-Trichlorophenol; 2,4-Dinitrophenol;2-Acetylaminofluorene;2-Nitropropane; 3,3'-Dimethoxybenzidine; 3,3'-Dimethylbenzidine;4,6-Dinitro-o-Cresol;4-Nitrophenol; Benzidine; Benzotrichloride; Beryllium; Bis(Chloromethyl)Ether; Bromoform; Calcium Cyanamide; Chlordane; Chloroacetic Acid; Chlorobenzilate; Chloromethyl Methyl Ether; Dichlorvos; Dimethylcarbamoyl Chloride; Ethylene Dibromide; Ethyleneimine; Heptachlor; Hexachlorobutadiene; Hexachlorocyclopentadiene; Hydrazine; Hydroquinone; Methoxychlor; Methyl Chloroform; Methyl Isocyanate; Methylhydrazine; N,N-Dimethylaniline; N-Nitroso-N-Methylurea; o-Anisidine; o-Toluidine; Parathion; Pentachloronitrobenzene; Phosgene; Propoxur; Quinoline; Quinone; Styrene Oxide; Toluene-2,4-Diamine; Toxaphene;
Pollutants with 95-99% or more (decimals counted) of mass captured by matched facilities
1,1,2,2-Tetrachloroethane; 1,1,2-Trichloroethane; 1,2,4-Trichlorobenzene; 1,3-Butadiene; Acetaldehyde; Acetamide; Acetophenone; Acrylonitrile; Acrolein; Allyl Chloride; Ammonia; Antimony; Arsenic; Benzyl Chloride; Cadmium; Carbaryl; Carbon Disulfide; Carbon Tetrachloride; Catechol; Chlorine; Chlorobenzene; Chloroform; Cresol/Cresylic Acid (Mixed Isomers); Cyanide (CN) and hydrogen cyanide (HCN) combined; Dibenzofuran; Diethyl Sulfate; Dimethyl Phthalate; Dimethyl Sulfate; Epichlorohydrin; Ethyl Acrylate; Ethyl Benzene; Ethyl Carbamate; Ethyl Chloride; Ethylene Oxide; Ethylene Glycol; Ethylidene Dichloride; Hexachlorobenzene; Formaldehyde; Hexachloroethane; Hexane; Hydrochloric Acid; Hydrogen Fluoride; Maleic Anhydride; Mercury; Methanol; Methyl Bromide; Methyl Iodide; Methyl Isobutyl Ketone; Methyl Methacrylate; Methylene Chloride; N,N-Dimethylformamide; Naphthalene; Nitrobenzene; p-Dioxane; p-Phenylenediamine; Phenol; Phthalic Anhydride; Propionaldehyde; Propylene Dichloride; Propylene Oxide; Selenium; Styrene; Sum of TRI: Polycylic Aromatic Compounds, Anthracene, Benzo[g,h,i]Perylene, and Phenanthrene; Tetrachloroethylene; Titanium Tetrachloride; Toluene; Triethylamine; Vinyl Acetate; Vinyl Chloride; Vinylidene Chloride; Xylenes (Mixed Isomers)

Pollutants with 90-94% or more (decimals counted) of mass captured by matched facilities
2,4-Dichlorophenoxy Acetic Acid; Acetonitrile; Aniline; Benzene; Bis(2-Ethylhexyl)Phthalate; Carbonyl Sulfide; Chromium; Cobalt; Dibutyl Phthalate; Ethylene Dichloride; Lead; Manganese; Methyl Chloride; Methyl Tert-Butyl Ether; Nickel; Phosphorus; Trichloroethylene;
Pollutants with 80-89% or more (decimals counted) of mass captured by matched facilities
1,3-Dichloropropene; 2,4-Dinitrotoluene; Asbestos; Biphenyl; Cumene; Diethanolamine;
Pollutants with 50-79% or more (decimals counted) of mass captured by matched facilities
4,4'-Methylenedianiline; Acrylamide; Acrylic Acid; Captan; Dichloroethyl Ether; Polychlorinated Biphenyls; Trifluralin
Pollutants with less than 30% of mass captured by matched facilities
2,4-Toluene Diisocyanate; 4,4'-Methylenebis(2-Chloraniline); Chloroprene; Ethylene Thiourea; Hydrogen Sulfide; Pentachlorophenol; Phosphine;
Pollutants with 0% of mass captured by matched facilities
1,2-Dibromo-3-Chloropropane (* emissions less than 0.05 lbs in TRI); 3,3'-Dichlorobenzidine (* zero emissions in TRI); 4-Aminobiphenyl (one facility emits this); Cellosolve Solvent; Ethylene Glycol Methyl Ether

Methodology used for these calculations and observations:

- **Attachment 1 contains more detailed data on NEI pollutants** that are also reported to TRI, including the total amount of emissions reported to TRI and the percentage of total TRI releases for that pollutant also captured in the NEI.

- **The team noticed discrepancies in analyses based on which data file or version was used. The team compared the February 2016 version of TRI Reporting Year 2014 data with the 2014 data pulled in February 2018.** Looking at facilities that emitted pollutants that are jointly reported to TRI and the NEI, this comparison revealed:
  - Some facilities have switched or merged IDs and may appear to have "no reports" in the older dataset. For example, in the 2016 version, 651 facility pollutant records (241 unique facilities) were nonzero, unlike their reports in the 2018 version.
  - 404 facility pollutant records (202 facilities) had a difference of greater than 10% of reported emissions in 2018 compared to the 2016 version.

3. Analysis based on NAICS Codes Metrics

NAICS codes covered by NEI and TRI
Other overlaps in the NEI/TRI reporting universes can be explored by NAICS codes for industry sectors. All facilities must report their six-digit NAICS code to TRI. However, some facilities in the NEI reported a higher-level NAICS code (e.g., two- or three-digit code) than the narrower six-digit code, and it is sometimes impossible to know whether a facility meets the NAICS code TRI reporting criterion without knowing the full six-digit code. However, most NAICS codes in the NEI (928 codes out of 1,283) were reported at the six-digit level.

Because NEI does not have any restrictions related to NAICS codes, this just examines the number and percent of NAICS codes covered by TRI reporting requirements that also report emissions data to NEI. Of those 928 six-digit NAICS codes reported in the NEI, 389 codes fall within the scope of TRI reporting requirements. Thus, **42% of all six-digit NAICS codes reported in the NEI are also within the TRI reporting universe.**

Table 2 lists the top ten NAICS codes, by number of reporting facilities, reporting to both the NEI and TRI. The NAICS codes in the NEI that do not fall under TRI reporting requirements are noted.

Table 2. The top ten NAICS codes in NEI (left) and TRI (right), by number of facilities reporting to each program in 2014. Asterisks (*) in the NEI column denote the NAICS codes that were not among those required to report to TRI in the 2014 reporting year.

Top NAICS codes in NEI				Top NAICS codes in TRI		
NAICS	**NAICS Code Description**	**Sum of NEI facilities reporting these NAICS codes**		**NAICS**	**NAICS Code Description**	**Sum of TRI facilities reporting these NAICS codes**
211111*	Crude Petroleum and Natural Gas Extraction	5779		221112	Fossil Fuel Electric Power Generation	545
211112*	Natural Gas Liquid Extraction	1595		311119	Other Animal Food Manufacturing	367
212321*	Construction Sand and Gravel Mining	1542		325199	All Other Basic Organic Chemical Manufacturing	415
221112	Fossil Fuel Electric Power Generation	1930		325211	Plastics Material and Resin Manufacturing	367
324121	Asphalt Paving Mixture and Block Manufacturing	1331		325510	Paint and Coating Manufacturing	412
447110*	Gasoline Stations with Convenience Stores	3479		325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	389

447190*	Other Gasoline Stations	1290	326199	All Other Plastics Product Manufacturing	470
486210*	Pipeline Transportation of Natural Gas	1482	327320	Ready-Mix Concrete Manufacturing	1106
562212	Solid Waste Landfill	1170	332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	498
811121*	Automotive Body, Paint, and Interior Repair and Maintenance	1993	424690	Other Chemical and Allied Products Merchant Wholesalers	518

Notes: The list of NAICS codes reporting to TRI may include facilities that are reporting voluntarily though their industry code is not obligated, or an establishment which is in a non-covered NAICS code but is within a larger facility that must report. Also, all NAICS codes starting with 5622 are covered by TRI, but with the qualifier that it only applies to RCRA subtitle C facilities.

Conclusions based on the Analysis of All Metrics

Number of NEI stationary source facilities	66,222
Number of NEI facilities reporting at least one pollutant that is also a TRI chemical	43,402
Number of NEI facilities reporting at least one pollutant that is also a TRI chemical *and* in a TRI-covered NAICS sector	Approx. 24,000
Number of NEI facilities also reporting to TRI	Approx. 10,000
Number of TRI-covered NAICS codes in NEI	389 (out of 928 six-digit NAICS codes reported to NEI overall)
Number of TRI facilities reporting air emission data	20,258
Number of TRI facilities reporting at least one NEI pollutant, with greater than 0 emissions	13,901
Number of TRI facilities also reporting to NEI with at least one overlapping reported pollutant/chemical	Approx. 9,700
Percent of TRI emissions captured in EIS from TRI facilities	97%

Reasons for TRI/NEI universe discrepancies

There are several potential reasons for the non-overlaps in the TRI and NEI universes:

- **The term “facility” is defined differently by each program.** NEI includes mobile sources, such as railroads. TRI facilities are all stationary sources.

- **The pollutant/chemical lists for the two programs do not overlap perfectly.** TRI includes approximately 200 toxic chemicals that are either not covered by NEI or defined differently such that reported emissions cannot be compared across the two programs. NEI also includes some CAPs (such as particulate matter) and other pollutants that are not covered by TRI.
- **TRI reporting requirements do not span across all NAICS codes, and fewer NAICS codes report to TRI than to NEI.** TRI also requires reporting NAICS codes at the six-digit level, whereas some facilities report NAICS codes at a higher level (e.g., three-digit NAICS codes) to SLTs.
- **TRI reporting requirements have different thresholds than are used by SLTs who voluntarily report HAPs to the NEI.** In some cases, this cold results in the NEI having emissions from facilities that would not have been required reported to TRI. In other cases there may be emissions in TRI that SLTs or EPA may not include in the NEI (particularly those with zero or close to zero emissions), or which emit at the thresholds lower than those which NEI uses to add TRI facilities not reported by SLTs.
- **TRI facilities may be multi-establishments, meaning that the facility is comprised of different economic units at that location.** The individual establishments have the option to report as a single facility, or as individual establishments. Although each facility has its own singular identification number regardless of its number of establishments, reporting by establishment makes matching NEI and TRI facilities, and counting their reported emissions, more difficult.
- **Data files and any subsequent revisions due to data quality checks are uploaded at different intervals for TRI and NEI.** NEI typically publishes two versions, then stops updating after the second version and no other changes (including corrections) are made. TRI data files, generated annually, are updated a few times throughout the year as ongoing data quality checks correct any potential issues. Data users must ensure the versions used are the most current. For instance, a TRI facility may need to revise its reporting form after the deadline, and NEI may pull and use a version of TRI data that does not include the updated data.
- **The issue of measuring and matching facilities and emissions across the board is inherently problematic due to different definitions for facilities and different facility identifiers** (e.g., the TRI Facility Identification Number and the Emissions Inventory System ID). Having different interpretations of facilities and establishments, facility identification systems and codes between the programs may create barriers to identifying facilities reporting to both programs.

Attachment 1. NEI pollutant emissions also reported to TRI, including the percentage of total TRI emissions matched to the NEI.

Poll	NEI Pollutant Code Description	TRI emissions Matched	Total TRI emissions	Percent Matched
79345	1,1,2,2-Tetrachloroethane	1.1	2,739	99.5%
79005	1,1,2-Trichloroethane	1.2	16,961	99.3%
57147	1,1-Dimethyl Hydrazine	1.0	13	100.0%
58899	1,2,3,4,5,6-Hexachlorocyclohexane	1.0	25	100.0%
120821	1,2,4-Trichlorobenzene	1.0	23,004	95.8%
96128	1,2-Dibromo-3-Chloropropane	-	0.03	0.0%
122667	1,2-Diphenylhydrazine	1.0	8.0	100.0%
106887	1,2-Epoxybutane	1.0	1,826	100.0%
75558	1,2-Propylenimine	1.1	339	100.0%
106990	1,3-Butadiene	1.3	1,220,401	95.2%
542756	1,3-Dichloropropene	1.0	6,965	88.5%
1120714	1,3-Propanesultone	1.0	120	100.0%
106467	1,4-Dichlorobenzene	1.0	26,489	100.0%
95954	2,4,5-Trichlorophenol	3.3	24	100.0%
88062	2,4,6-Trichlorophenol	0.8	15	100.0%
94757	2,4-Dichlorophenoxy Acetic Acid	1.0	1,433	94.7%
51285	2,4-Dinitrophenol	1.0	2,534	100.0%
121142	2,4-Dinitrotoluene	1.0	12,056	88.3%
584849	2,4-Toluene Diisocyanate	1.0	2,580	19.4%
53963	2-Acetylaminofluorene	1.0	61	100.0%
79469	2-Nitropropane	1.0	33,766	100.0%
91941	3,3'-Dichlorobenzidine	-	-	0.0%
119904	3,3'-Dimethoxybenzidine	1.0	8.0	100.0%
119937	3,3'-Dimethylbenzidine	1.0	8.0	100.0%
101144	4,4'-Methylenebis(2-Chloraniline)	1.0	3,282	23.4%
101779	4,4'-Methylenedianiline	1.1	3,380	61.3%
534521	4,6-Dinitro-o-Cresol	1.0	2.0	100.0%
92671	4-Aminobiphenyl	-	109	0.0%
100027	4-Nitrophenol	1.0	1.7	100.0%
75070	Acetaldehyde	1.2	9,227,398	97.5%
60355	Acetamide	1.0	203	99.0%
75058	Acetonitrile	1.0	370,123	94.1%
98862	Acetophenone	1.1	108,273	99.1%
107028	Acrolein	1.1	277,406	100.0%
79061	Acrylamide	1.0	19,758	54.4%
79107	Acrylic Acid	0.9	278,135	78.8%
107131	Acrylonitrile	1.1	390,458	98.3%
107051	Allyl Chloride	0.9	22,980	96.3%
NH3	Ammonia	1.0	113,984,599	98.4%
62533	Aniline	1.0	108,935	92.6%
7440360	Antimony	0.9	30,154	95.9%
7440382	Arsenic	1.2	58,456	98.8%
1332214	Asbestos	1.0	112	80.7%
71432	Benzene	1.1	3,489,871	94.0%
92875	Benzidine	1.0	8.1	100.0%
98077	Benzotrichloride	1.0	8.1	100.0%
100447	Benzyl Chloride	1.0	29,053	100.0%
7440417	Beryllium	4.9	4,229	99.8%
92524	Biphenyl	1.0	218,445	82.5%
117817	Bis(2-Ethylhexyl)Phthalate	0.9	41,831	93.7%
542881	Bis(Chloromethyl)Ether	1.0	0.1	100.0%
75252	Bromoform	1.0	5,546	100.0%
7440439	Cadmium	1.0	11,165	99.5%
156627	Calcium Cyanamide	1.0	20	100.0%
133062	Captan	0.6	38	73.7%
63252	Carbaryl	1.0	540	98.0%
75150	Carbon Disulfide	1.0	9,646,372	100.0%

56235	Carbon Tetrachloride	1.1	106,738	96.3%
463581	Carbonyl Sulfide	1.0	14,114,864	93.4%
120809	Catechol	2.0	4,948	100.0%
110805	Cellosolve Solvent	0	12,119	0.0%
57749	Chlordane	1.0	31	100.0%
7782505	Chlorine	1.0	4,337,341	99.1%
79118	Chloroacetic Acid	0.6	4,436	100.0%
108907	Chlorobenzene	1.0	438,763	99.7%
510156	Chlorobenzilate	1.0	8.0	100.0%
67663	Chloroform	1.2	367,979	98.5%
107302	Chloromethyl Methyl Ether	1.0	598	100.0%
126998	Chloroprene	0.8	263,607	0.6%
7440473	Chromium	1.0	359,653	92.7%
7440484	Cobalt	1.1	41,044	91.9%
cresols	CRESOLS (o,m,p summed together)	1.2	1,290,800	96.1%
98828	Cumene	1.3	811,854	88.1%
cyanides	cyanides (CN and HCN summed together)	3.9	7,481,033	99.9%
132649	Dibenzofuran	1.7	6,416	95.5%
84742	Dibutyl Phthalate	0.4	6,967	93.4%
111444	Dichloroethyl Ether	1.0	152	52.5%
62737	Dichlorvos	1.0	15	100.0%
111422	Diethanolamine	1.0	167,130	85.8%
64675	Diethyl Sulfate	1.2	5,468	95.0%
131113	Dimethyl Phthalate	0.9	105,165	99.6%
77781	Dimethyl Sulfate	1.1	637	98.4%
79447	Dimethylcarbamoyl Chloride	1.0	8.1	100.0%
106898	Epichlorohydrin	1.4	99,148	96.9%
140885	Ethyl Acrylate	1.0	61,861	97.9%
100414	Ethyl Benzene	1.1	2,736,616	97.3%
51796	Ethyl Carbamate	1.0	207	98.5%
75003	Ethyl Chloride	1.1	163,431	99.5%
106934	Ethylene Dibromide	1.0	838	100.0%
107062	Ethylene Dichloride	1.3	377,404	94.6%
107211	Ethylene Glycol	1.5	2,196,954	97.2%
109864	Ethylene Glycol Methyl Ether	-	7,241	0.0%
75218	Ethylene Oxide	1.2	318,482	96.1%
96457	Ethylene Thiourea	1.4	142	17.6%
151564	Ethyleneimine	1.0	0.1	100.0%
75343	Ethylidene Dichloride	1.1	8,494	99.9%
50000	Formaldehyde	1.1	4,729,371	98.2%
76448	Heptachlor	1.0	8.8	100.0%
118741	Hexachlorobenzene	1.0	1,265	100.0%
87683	Hexachlorobutadiene	1.0	2,356	100.0%
77474	Hexachlorocyclopentadiene	1.0	326	100.0%
67721	Hexachloroethane	1.0	914	99.9%
110543	Hexane	1.0	32,824,214	98.7%
302012	Hydrazine	1.4	1,127	100.0%
7647010	Hydrochloric Acid	0.8	108,633,738	96.9%
7664393	Hydrogen Fluoride	0.8	20,357,863	97.1%
7783064	Hydrogen Sulfide	1.2	20,570,603	0.0%
123319	Hydroquinone	1.1	8,379	100.0%
7439921	Lead	1.0	429,524	91.1%
108316	Maleic Anhydride	1.1	309,879	99.9%
7439965	Manganese	1.1	1,249,331	94.7%
7439976	Mercury	1.0	76,779	98.2%
67561	Methanol	1.0	107,273,404	95.9%
72435	Methoxychlor	1.0	9.1	100.0%
74839	Methyl Bromide	0.8	165,724	98.1%
74873	Methyl Chloride	1.0	1,043,409	92.6%
71556	Methyl Chloroform	1.6	82,238	100.0%
74884	Methyl Iodide	1.0	23,204	100.0%
108101	Methyl Isobutyl Ketone	1.0	3,118,312	97.5%
624839	Methyl Isocyanate	2.7	11	100.0%

80626	Methyl Methacrylate	1.0	1,735,677	98.7%
1634044	Methyl Tert-Butyl Ether	1.1	138,315	91.5%
75092	Methylene Chloride	1.1	2,944,799	96.3%
60344	Methylhydrazine	30.0	6.0	100.0%
121697	N,N-Dimethylaniline	1.0	1,092	100.0%
68122	N,N-Dimethylformamide	1.0	220,348	97.9%
91203	Naphthalene	1.4	1,208,287	97.9%
7440020	Nickel	1.0	390,859	93.7%
98953	Nitrobenzene	1.0	23,819	100.0%
684935	N-Nitroso-N-Methylurea	1.0	0.010	100.0%
90040	o-Anisidine	1.0	243	100.0%
95534	o-Toluidine	1.0	3,876	100.0%
56382	Parathion	1.0	5.1	100.0%
123911	p-Dioxane	1.2	96,438	99.9%
82688	Pentachloronitrobenzene	1.0	1.1	100.0%
87865	Pentachlorophenol	1.1	217	29.7%
108952	Phenol	1.1	3,994,620	95.9%
75445	Phosgene	1.7	13,139	100.0%
7803512	Phosphine	1.0	8,236	3.5%
7723140	Phosphorus	1.0	3,225	91.0%
85449	Phthalic Anhydride	1.1	243,220	100.0%
1336363	Polychlorinated Biphenyls	0.2	118	65.6%
106503	p-Phenylenediamine	1.0	65,134	98.3%
123386	Propionaldehyde	1.1	172,397	100.0%
114261	Propoxur	1.0	3.1	100.0%
78875	Propylene Dichloride	3.2	81,913	100.0%
75569	Propylene Oxide	1.0	391,511	99.5%
91225	Quinoline	3.1	2,250	100.0%
106514	Quinone	5.3	358	100.0%
7782492	Selenium	1.2	266,625	96.1%
100425	Styrene	1.0	26,338,865	95.6%
96093	Styrene Oxide	1.0	36	100.0%
Sum of PACs, Anthracene, Benzo[g,h,i]Perylene, and Phenanthrene	Sum of TRI: Polycylic Aromatic Compounds, Anthracene, Benzo[g,h,i]Perylene, and Phenanthrene	3.5	1,359,704	98.1%
127184	Tetrachloroethylene	1.0	799,500	96.9%
7550450	Titanium Tetrachloride	1.0	23,846	97.5%
108883	Toluene	1.0	22,079,142	96.0%
95807	Toluene-2,4-Diamine	1.0	447	100.0%
8001352	Toxaphene	1.0	15	100.0%
79016	Trichloroethylene	1.0	1,960,986	94.8%
121448	Triethylamine	1.4	225,028	95.9%
1582098	Trifluralin	1.0	2,066	75.8%
108054	Vinyl Acetate	1.0	1,176,434	98.9%
75014	Vinyl Chloride	1.3	551,089	98.9%
75354	Vinylidene Chloride	1.0	32,919	99.7%
xylenes	XYLENES (o,m,p and mixed, summed together)	1.2	14,524,540	95.5%

APPENDIX B: Comparison of NEI emissions reported by SLT with TRI emissions

Comparison of NEI emissions reported by SLT with TRI emissions

Introduction

TRI emissions are submitted by facilities to the TRI, and NEI emissions are submitted by State, local and Tribal Agencies (SLTs) to the NEI. Emissions are further gapfilled by EPA using other databases including TRI. These are documented in the 2014 NEI v2 TSD. We used the subset of NEI data that came from SLTs and compared it to the TRI for facilities that matched up between the TRI and NEI. We compared facility-level emissions of 2014 NEI data submitted by SLT with the 2014 TRI data. The purpose was to determine how these data compare and how differences vary by state, pollutant and industry type. We also compared, for this subset, the release point information. We looked at distribution of the emissions between stack versus fugitive release points to determine how differences vary by state and industry type.

Methods Emissions Comparisons

We used a facility pollutant comparison summary from EIS for the 2014 NEI v2 which provides 2014 NEI v2 emissions and TRI emissions loaded into EIS from the TRI basics files downloaded February 2016. We merged in the NEI dataset ids that provide the source of the NEI data (i.e., which SLT agency or EPA dataset).

We treated pollutants belonging to pollutant groups as a group total for both TRI and NEI because of the nature of reporting that allows reporting of either the general group or individual compounds. We summed the species of chromium so we could compare total TRI chromium with total SLT chromium. We also applied a factor to properly account for the mass of chromium and nickel for specific chromium and nickel compounds containing non-chromium ions. Also we learned that for some states "CN" is the total HCN and CN, so we summed those together in both TRI and NEI databases.

A summary of how we aggregated these is provided in Table 1.

Table 1. Pollutant Groups used in NEI and TRI comparisons

Group	Consists of NEI emissions of:	Consists of TRI emissions of:
Xylenes	m-xylene o-xylene p-xylene xylenes, mixed isomers	m-xylene o-xylene p-xylene xylenes, mixed isomers
Cresols	m-Cresol o-Cresol p-Cresol Cresol/Cresylic Acid (Mixed Isomers)	m-Cresol o-Cresol p-Cresol Cresol (mixed isomers)
Cyanide	Hydrogen cyanide Cyanide compounds	Hydrogen cyanide Cyanide compounds
Chromium	Chromium (VI) Chromium (III) Chromium	Chromium Chromium compounds

	Chromic Acid VI (CAS no. 7738945) multiplied by 0.4406 Chromium trioxide (CAS no. 1333820) multiplied by 0.52	
Nickel	Nickel Refinery Dust Nickel oxide (CAS no. 1313991) multiplied by 0.7412 Nickel	Nickel Nickel compounds

All PAH groups and individual PAHs and glycol ether groups and individual glycol ethers were dropped from the comparison since the TRI program doesn't cover all PAHs, and the NEI excludes ethylene glycol monbutyl ether (butyl cellusolve) but that pollutant is included in the TRI pollutant "certain glycol ethers". Even though TRI and NEI includes individual compounds from these categories, we chose also not to include them since for the NEI, these may be reported by the groups rather than as individual compounds.
Because one pollutant may have multiple data sources at a single facility, we chose facility-pollutant combinations for which emissions came solely from SLT-provided data. The SLT-TRI comparison database was comprised of 15,314 facility-pollutant pairs, covering 123 pollutants and 4594 facilities that are solely from SLT and for which there is also a non-zero TRI estimate.

Emissions Release Point comparisons

There are 4797 observations identified where the TRI-to-NEI (where NEI is from SLT) total emissions ratio is between 0.98 and 1.02 at the facility level. Both TRI and NEI provide sub-facility emissions. The TRI provides each facility's emissions by stack and fugitive releases. The NEI provides emissions by specific process and release point; which can be summed up to stack and fugitive releases. To further the analysis, we looked at metrics to compare how facility emissions were characterized into fugitive and stack releases

After reviewing several options for metrics, it was decided that the most beneficial was in looking at the differences in fugitive and stack ratios. The fugitive ratio is defined as emissions of fugitives/total emissions and the stack ratio is defined as the emissions of stack/total emissions. Ratios are calculated for each pollutant at each facility for TRI and NEI databases (i.e., 4797 observations). Using these metrics, the following criteria were used to set flags on the data to isolate observations that were different: 1.) If (TRI fugitive ratio) - (NEI fugitive ratio) > absolute value of 0.1 then flag 2.) If (TRI stack ratio) - (NEI stack ratio) > absolute value of 0.1 then flag. Using these flags, we were able to identify records where the distribution between stack and fugitive emissions were not aligned between TRI and NEI. So, while the total emissions ratio was very close to one, there were very notable differences between how these emission releases were characterized.

The first thought was that the definition of fugitive emissions is different between the two data programs. The TRI definition, as taken from the online reporting form and instructions, is to "Report the total of all releases of the EPCRA Section 313 chemical to the air that are not released through stacks, vents, ducts, pipes, or any other confined air stream. You must include (1) fugitive equipment leaks from valves, pump seals, flanges, compressors, sampling connections, open-ended lines, etc.; (2) evaporative losses from surface impoundments and spills; (3) releases from building ventilation systems; and (4) any other fugitive or non-point air emissions. Engineering estimates and mass balance calculations (using purchase records, inventories, engineering knowledge or process specifications of the quantity of the EPCRA Section 313 chemical entering product,

hazardous waste manifests, or monitoring records) may be useful in estimating fugitive emissions. You should check the NA box in Section 5.1 if you do not engage in activities that result in fugitive or non-point air emissions of this listed toxic chemical. For VOCs, NA generally would not be applicable."
The NEI does not have any formal definition of fugitive sources documented anywhere though after review of the TRI definition, it is assumed that SLTs reporting to NEI are not likely using a definition that differs greatly from TRI. Therefore, we feel that a difference in fugitive definitions between the two data programs is not likely the cause of the differences between stack and fugitive reported emissions.

Results Analysis of where NEI (SLT) facility emissions are 0 and TRI >0

Of the 15,314 facility-pollutant pairs, there are 215 for which SLT reported a value of 0 to the NEI (rather than leaving it missing) and TRI is greater than 0. This is a tiny fraction of the 15,314 records from the SLT, however, they are of interest because 0 is considered a value. TRI is not used for gap filling the NEI in these instances. If the value were missing, TRI would have been used. This results in differences between the NEI and TRI, which would not have been different had the value been missing.

Figure 1 shows the number of records by state where SLT reported 0 and TRI is greater than 0. It also shows the number of records with TRI emissions > 100 lbs. Of the 215, less than half (101) records had TRI emissions > 100lbs, indicating the potential for SLT to report 0 where emissions were below certain thresholds. This is evident in Figure 1 where most states have significantly lower number of 0s for facilities > 100 lbs.
Table 1 provides the mass of pollutant by state along with the number of records by state and pollutant. Lead was the pollutant most commonly (most number of records) reported as 0 by SLT. The sum of TRI lead mass for these instances is 1.6 tons. Methanol had the most mass, followed by ammonia and xylenes.

Figure 1. Number of facility-pollutant records by state (out of 215 total) where SLT reported 0 and TRI > 0

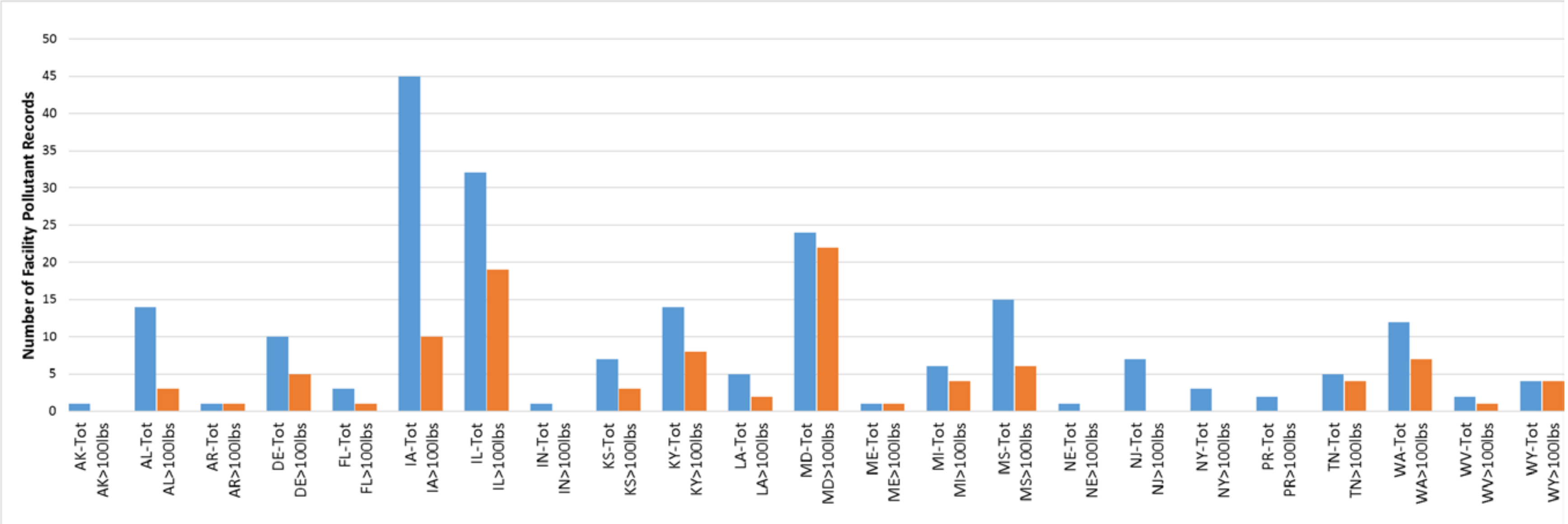


Table 2. TRI Mass for pollutants for which states reported 0 emissions (sum across the 215 facilities). Number of facility records and pollutant records are indicated in parentheses.

	AK (1)	AL (14)	AR (1)	DE (10)	FL (3)	IA (45)	IL (32)	IN (1)	KS (7)	KY (14)	LA (5)	MD (24)	ME (1)	MI (6)	MS (15)	NE (1)	NJ (7)	NY (3)	PR (2)	TN (5)	WA (12)	WV (2)	WY (4)	Grand Total
1,3-Butadiene (1)							0.31																	0.3
4-Nitrophenol (1)																	2E-5							2.E-5
Acetaldehyde (1)												21.												21
Acrylic Acid (1)							1.0																	1.0
Allyl Chloride (1)		.03																						0.03
Ammonia (14)		3.0				12	1.4				0.62	82.		40								.07	24	163
Aniline (1)				.01																				.01
Antimony (1)							0.25																	0.25
Benzene (1)														0.35										0.35
Biphenyl (2)				.045						0.09														0.1
Carbon Disulfide (3)				.61						0.35											.06			1.0
Carbonyl Sulfide (1)				.25																				.25
Chlorine (4)		3E-3										.101	.20									.005		0.3
Chromium (8)						0.16					0.017	.004			0.85									1.0

	AK (1)	AL (14)	AR (1)	DE (10)	FL (3)	IA (45)	IL (32)	IN (1)	KS (7)	KY (14)	LA (5)	MD (24)	ME (1)	MI (6)	MS (15)	NE (1)	NJ (7)	NY (3)	PR (2)	TN (5)	WA (12)	WV (2)	WY (4)	Grand Total
Cobalt (1)											5.E-4													5.E-4
Cresols (2)												8.0									0.10			8.1
Cumene (4)		.001					.47		0.03												0.22			0.7
Cyanides (2)				0.36																.56				0.9
Dibutyl Phthalate (1)										5.E-4														5.E-4
Diethanolamine (1)							0.42																	0.42
Dimethyl Phthalate (1)															1.1									1.1
Ethyl Benzene (4)						0.009				1.5405		0.67												2.2
Ethylene Dibromide (1)															0.01									0.01
Ethylene Glycol (4)		0.015								4E-4							5.E-4			0.39				0.4
Ethylene Oxide (2)							3.2								5.E-4									3.2
Formaldehyde (2)						0.247						4.2												4.44
Hexachlorobenzene (1)				5E-5																				5E-5
Hexane (4)						1.5	0.066		0.65			2.2												4.4
Hydrazine (1)							0.003																	0.003
Hydrochloric Acid (4)					0.29	4.4				13.5		142												160
Hydrogen Fluoride (4)			0.13				6.3					24.2												31
Hydrogen Sulfide (4)							22			23				9.1										54
Lead (56)	0.042	1.02			3E-5	0.13	0.046			0.041	0.008	0.039		0.01	0.14	4.E-3	1.E-3		0.018		0.11			1.6
Manganese (10)		0.43				0.009	0.006			0.327					0.25			0.005		0.12				1.1
Mercury (6)		3.E-4				0.004	5E-5								5.E-5									.004
Methanol (6)				2.57		0.005				2.05		176											1.9	183
Methyl Chloride (1)												17												17.4
Methyl Isobutyl Ketone (4)						0.007	2.4			3.9														6.2
Methyl Tert-Butyl Ether (1)																				1.0				1.0
Naphthalene (7)							0.008	0.005	0.005			3.2						0.01						3.2
Nickel (12)						0.24	0.012		0.053	.013					0.50					0.04				0.8
Phenol (4)				.076								10.24			0.008						0.11			10.4
Phthalic Anhydride (1)		2.E-3																						1.5E-3
Propionaldehyde (1)																					1.E-3			1.E-3
Styrene (1)				6E-3																				5.5E-3
Tetrachloroethylene (4)				3E-3			0.004				.399										0.03			0.44
Toluene (7)							1.3		0.74			2.5									3.9			8.4
Trichloroethylene (1)							4.2																	4.4
Xylenes (10)					.001		41		0.18			0.78			2.7						0.16			45
Grand Total	0.04	4.5	0.13	3.9	0.29	18.5	85.0	0.005	1.6	44	1.0	495	0.20	49	5.5	0.004	0.002	0.018	0.018	2.1	4.7	0.08	26	742

SLT AND TRI emissions comparisons – where emissions > 0 for matching facilities/pollutants

There are 15,099 facility-pollutant pairs with non-zero SLT and TRI emissions.
Tables 3 shows the 122 pollutants present in the comparison dataset and the sum of SLT and TRI emissions across this dataset. Note that this sum is not the total emissions but rather the total across facilities that were matched between NEI and TRI. Roughly half the pollutants agree to within 10% and three quarters of the pollutants agree within 20% when summed across all facilities.

Table 3. Pollutants covered in the SLT/TRI comparison dataset and emissions totals by pollutants

polldesc	2014 SLT - submitted emissions from the NEI (tons)	2014 NEI TRI emissions (tons)	percent diff	polldesc	2014 SLT (tons)	2014 TRI (tons)	percent diff
1,1,2,2-Tetrachloroethane	1.234	1.338	8.4%	Ethylene Dichloride	133.6	175.1	31.1%
1,1,2-Trichloroethane	7.215	8.412	16.6%	Ethylene Glycol	521.4	779.1	49.4%
1,2,4-Trichlorobenzene	2.313	2.435	5.3%	Ethylene Oxide	100.1	124.1	24.0%
1,2-Epoxybutane	0.756	0.745	-1.5%	Ethylene Thiourea	8.00E-04	0.0045	462.5%
1,2-Propylenimine	0.099	0.109	10.5%	Ethylidene Dichloride	3.731	4.242	13.7%
1,3-Butadiene	406.4	552.7	36.0%	Formaldehyde	1,644	1,755	6.7%
1,3-Dichloropropene	1.537	1.540	0.2%	Hexachlorobenzene	0.125	0.132	5.4%
1,4-Dichlorobenzene	12.200	12.183	-0.1%	Hexachlorobutadiene	1.180	1.176	-0.3%
2,4,5-Trichlorophenol	0.0036	0.012	233.3%	Hexachlorocyclopentadiene	0.149	0.156	4.8%
2,4,6-Trichlorophenol	0.0036	0.0015	-58.3%	Hexachloroethane	0.442	0.446	0.8%
2,4-Dinitrotoluene	0.0013	0.008	515.4%	Hexane	15,345	14,674	-4.4%
2,4-Toluene Diisocyanate	0.049	0.056	14.2%	Hydrazine	0.231	0.243	5.5%
2-Nitropropane	16.875	16.882	0.0%	Hydrochloric Acid	56,233	44,667	-20.6%
4,4'-Methylenedianiline	0.853	0.979	14.7%	Hydrogen Fluoride	10,568	8,068	-23.7%
Acetaldehyde	3,013	3,655	21.3%	Hydrogen Sulfide	1,704	2,511	47.4%
Acetonitrile	100.191	96.654	-3.5%	Hydroquinone	3.558	3.887	9.2%
Acetophenone	35.837	40.163	12.1%	Lead	165.7	150.0	-9.4%
Acrolein	87.077	103.4	18.7%	Maleic Anhydride	124.4	142.5	14.6%
Acrylamide	5.118	5.173	1.1%	Manganese	327.1	363.5	11.1%
Acrylic Acid	95.261	87.052	-8.6%	Mercury	28.025	27.793	-0.8%
Acrylonitrile	169.5	168.2	-0.8%	Methanol	39,662	39,321	-0.9%
Allyl Chloride	8.914	7.993	-10.3%	Methyl Bromide	97.509	71.814	-26.4%
Ammonia	48,430	46,480	-4.0%	Methyl Chloride	402.6	402.0	-0.2%
Aniline	34.297	33.070	-3.6%	Methyl Chloroform	25.370	25.548	0.7%
Antimony	8.412	6.349	-24.5%	Methyl Iodide	9.782	9.804	0.2%
Arsenic	17.517	15.375	-12.2%	Methyl Isobutyl Ketone	958.5	936.3	-2.3%
Asbestos	0.013	0.013	1.1%	Methyl Isocyanate	0.001	0.0045	350.0%
Benzene	1,290	1,423	10.3%	Methyl Methacrylate	675.3	699.4	3.6%
Benzyl Chloride	4.874	4.958	1.7%	Methyl Tert-Butyl Ether	41.991	48.555	15.6%
Beryllium	0.197	1.836	830.1%	Methylene Chloride	949.1	997.4	5.1%
Biphenyl	55.300	55.743	0.8%	Methylhydrazine	1.00E-04	0.003	2900.0%
Bis(2-Ethylhexyl)Phthalate	6.258	3.125	-50.1%	N,N-Dimethylformamide	89.688	86.983	-3.0%
Bromoform	2.773	2.773	0.0%	Naphthalene	335	417	24.4%
Cadmium	1.025	0.815	-20.5%	Nickel	71.893	102	41.7%
Captan	0.013	0.005	-62.7%	Nitrobenzene	9.608	9.043	-5.9%
Carbon Disulfide	4,553	4,716	3.6%	o-Anisidine	0.122	0.122	0.0%
Carbon Tetrachloride	43.542	49.369	13.4%	o-Toluidine	0.540	0.629	16.5%
Carbonyl Sulfide	3,472	3,517	1.3%	p-Dioxane	36.865	43.244	17.3%
Catechol	0.611	0.809	32.3%	Pentachlorophenol	0.00598	.00800	33.8%
Chlorine	2,123	2,068	-2.6%	Phenol	1,332	1,480	11.2%
Chloroacetic Acid	2.174	0.428	-80.3%	Phosgene	1.090	1.147	5.2%
Chlorobenzene	109.7	110.7	0.9%	Phosphorus	0.027	0.027	-0.3%
Chloroform	143.6	169.2	17.8%	Phthalic Anhydride	100.9	113.4	12.3%
Chloroprene	0.930	0.785	-15.7%	p-Phenylenediamine	0.474	0.472	-0.5%

polldesc	2014 SLT - submitted emissions from the NEI (tons)	2014 NEI TRI emissions (tons)	percent diff	polldesc	2014 SLT (tons)	2014 TRI (tons)	percent diff
Chromium	76.295	90.302	18.4%	Propionaldehyde	80.281	84.722	5.5%
Cobalt	6.938	7.775	12.1%	Propylene Dichloride	10.782	7.914	-26.6%
Cresols	374.0	421.8	12.8%	Propylene Oxide	176.5	172.2	-2.4%
Cumene	167.5	248.7	48.4%	Quinoline	0.232	0.292	25.6%
Cyanides	2,380	2,852	19.8%	Selenium	92.900	110.5	19.0%
Dibenzofuran	0.085	0.462	440.7%	Styrene	9,247	9,639	4.2%
Dibutyl Phthalate	6.584	1.206	-81.7%	Tetrachloroethylene	237.0	249.0	5.1%
Dichloroethyl Ether	0.013	0.014	2.4%	Titanium Tetrachloride	1.062	1.040	-2.1%
Diethanolamine	41.812	37.934	-9.3%	Toluene	8,040	8,264	2.8%
Diethyl Sulfate	2.107	2.547	20.9%	Toluene-2,4-Diamine	0.217	0.223	2.7%
Dimethyl Phthalate	38.122	33.415	-12.3%	Trichloroethylene	573.8	604.1	5.3%
Dimethyl Sulfate	0.174	0.204	17.0%	Triethylamine	28.855	30.613	6.1%
Epichlorohydrin	20.891	35.080	67.9%	Trifluralin	0.0065	.00245	-62.3%
Ethyl Acrylate	18.105	17.969	-0.8%	Vinyl Acetate	473.4	443.8	-6.2%
Ethyl Benzene	833.1	937.0	12.5%	Vinyl Chloride	215.3	272.0	26.4%
Ethyl Chloride	70.549	78.311	11.0%	Vinylidene Chloride	16.176	16.357	1.1%
Ethylene Dibromide	0.390	0.394	1.0%	Xylenes	4,489	5,074	13.0%

Comparison of facility-pollutant emissions ratios

While the sums compare well for most pollutants, when compared at individual facilities by pollutant, there can be significant differences.

To eliminate the skew of ratios between small numbers, we removed all observations where both SLT and TRI emissions were below 0.5 lbs (0.00025 tons). This resulted in 14,897 (4484 facilities) observations for which we computed the ratio of the TRI and SLT estimate. We binned the ratios into the 5 ranges shown in Table 4. The largest number of ratios are in the bin closest to 1 (between 0.9 and 1.1); there are more records with ratios above 1.1 than below 0.9.

Table 4. Distribution of the TRI to NEI ratios by bin

TRI-to-NEI Emissions Ratio	Number of facility-pollutant observations	Percent of facility-pollutant observations
Less than 0.5	1478	10%
Between 0.5 and 0.9	1450	10%
Between 0.9 and 1.1	6788	46%
Between 1.1 and 2	2178	15%
Greater than 2	3003	20%
TOTAL OBS	14,987	

Figures 2 -4 show how the distribution of the ranges of ratios vary by pollutant, state and facility type. In the pollutant plot we show only pollutants with more than 50 data points. For most pollutants, the highest fraction of ratios is between 0.9 and 1.1; exceptions to this are a few metals: Chromium, Cobalt, Manganese and Nickel.

Figure 3 shows the distribution of the bins across states. Some states and Puerto Rico have very few records with both SLT and TRI data. For 36 states, the highest fraction of ratios is between 0.9 and 1.1. States where the highest fraction of data are above 2 are CA, ID, IL, KY, MI, NE, NH, OH and WY.

Figure 4 shows the distribution across NEI facility types, for types with more than 25 data points. For 20 facility types and other, the highest fraction of ratios is between 0.9 and 1.1. Facility types where the highest fraction of data have a ratio > 2 are Automobile/Truck or Parts Plant, Fabricated Metal Products Plant, Foundries, non-ferrous, Military Base, and Secondary Aluminum Smelting/Refining Plant.

Figure 2. Distribution of the ranges of the TRI/NEI ratio by pollutant, for pollutants with more than 50 data points (N); with N shown.

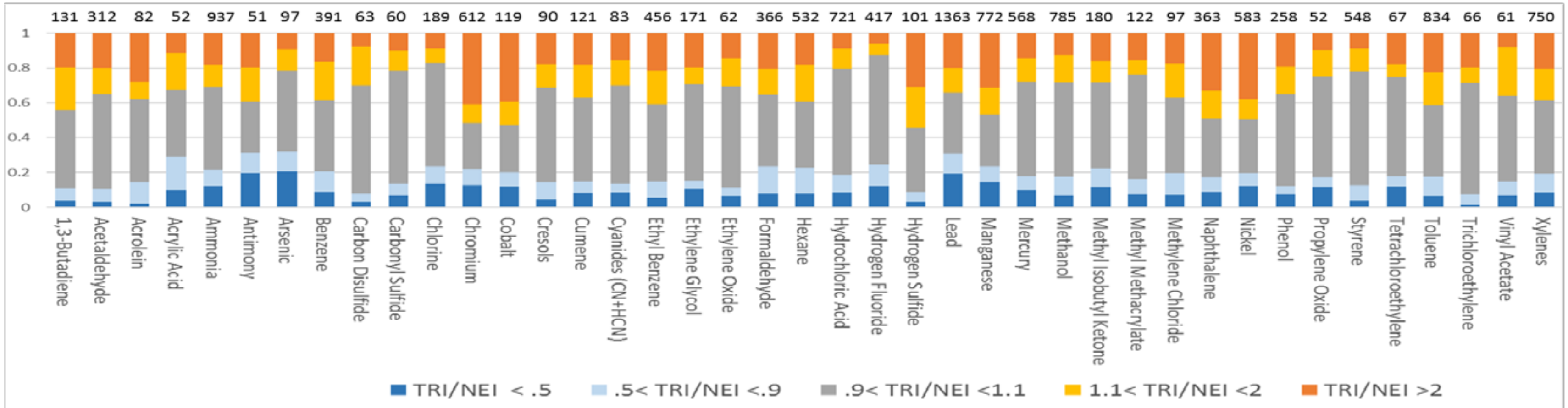


Figure 3. Distribution of the ranges of the TRI/NEI ratio by state, with number of data points (N) shown at the top of each bar.

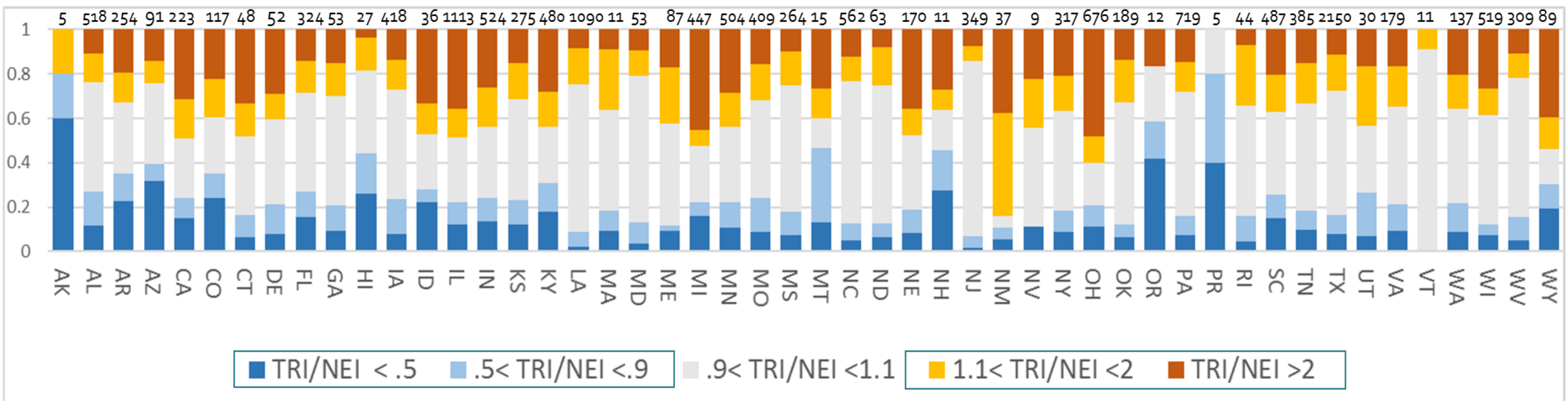
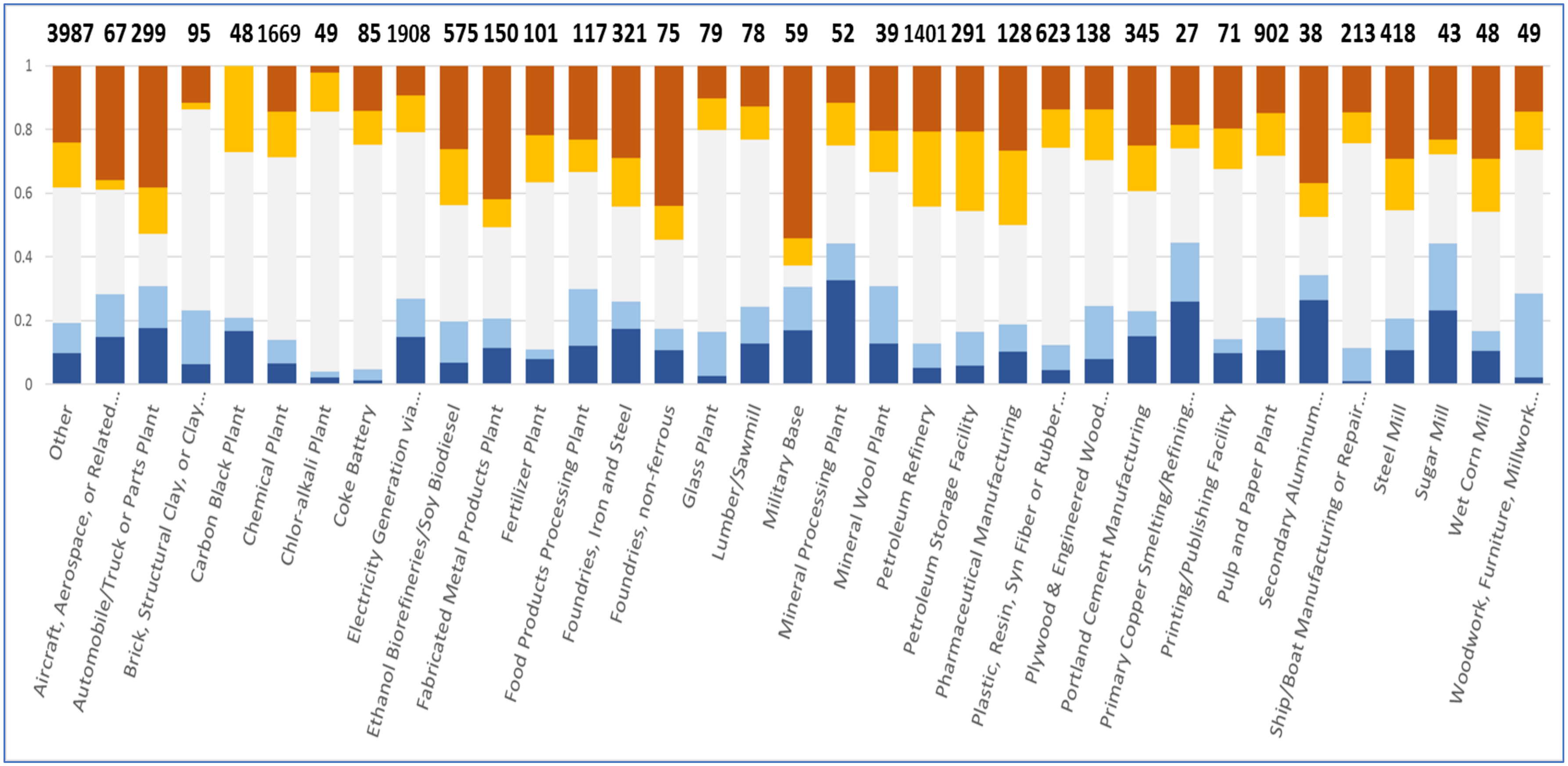


Figure 4. Distribution of the ranges of the TRI/NEI ratio by facility type, with facility types with more than 25 data points (N). with N shown.



Figures 5-7 display the magnitude of the TRI to SLT ratios, by showing the distribution and mean across pollutants, states and facility types, respectively. Similar to Figures 2-4, pollutants are limited to those with more than 50 data points and facility types are limited to those with more than 25 data points. The bars show the 25th and 75th percentiles and the whiskers show the 10th and 90$^{th;}$ and the mean is shown by the black dot. All plots are shown with a logarithmic y-axis, indicating the presence of ratios that vary across orders of magnitude. In both plots we see the mean ratio value significantly larger than the 90th percentile indicating the presence of outlier ratios.
For all 3 plots, the median, for most pollutants, states and industry types is 1 but the mean ratio is, in most cases, orders of magnitude higher than 1.
There are however, some pollutants, states and industry types, as shown in Table 4, in which the median is significantly different from 1. Note that only pollutants, states and industries with > 25 data points are included

Table 5 Categories (pollutants, states, industry types) where the median ratio is significantly different from 1, for categories with > 25 data points.

Analysis Category	Median	Number of Data points
Beryllium	1.23	26
Chromium	1.22	622
Hydrogen Sulfide	1.16	99
Cobalt	1.13	124
Ohio	1.83	676
New Mexico	1.60	37
Michigan	1.26	447
Wyoming	1.20	89
Military Base	2.11	59
Fabricated Metal Products Plant	1.22	150
Automobile/Truck or Parts Plant	1.18	299
Foundries, non-ferrous	1.31	75

All data underlying Figures 5-7 (i.e., the percentiles and mean ratio) as well as the minimum and maximum values are provided in Attachment 1.

Figure 5. Percentile Distribution and mean TRI/NEI ratios by pollutant. N=number of records.

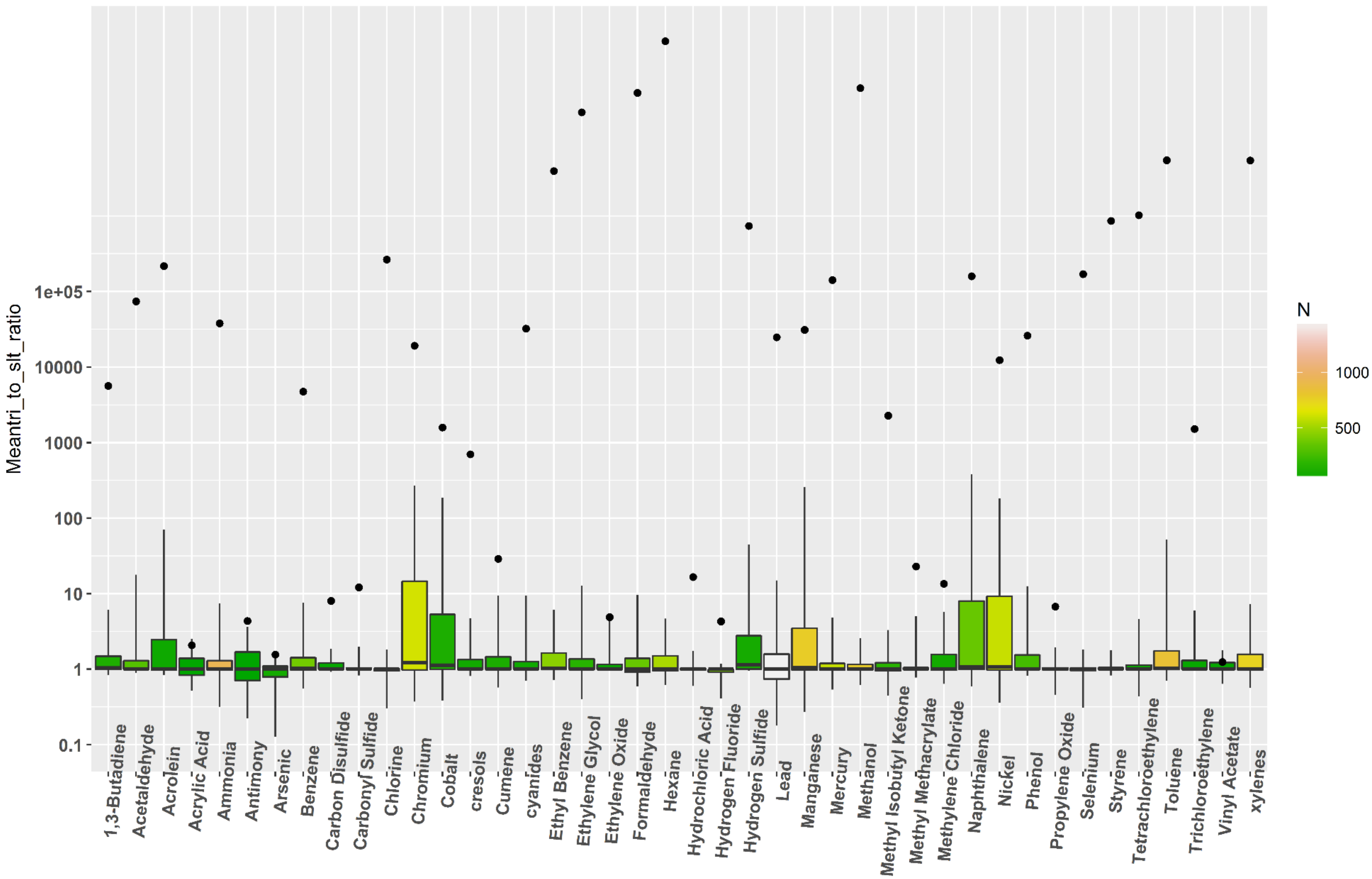


Figure 6. Percentile Distribution and mean TRI/NEI ratios by state. N=number of records.

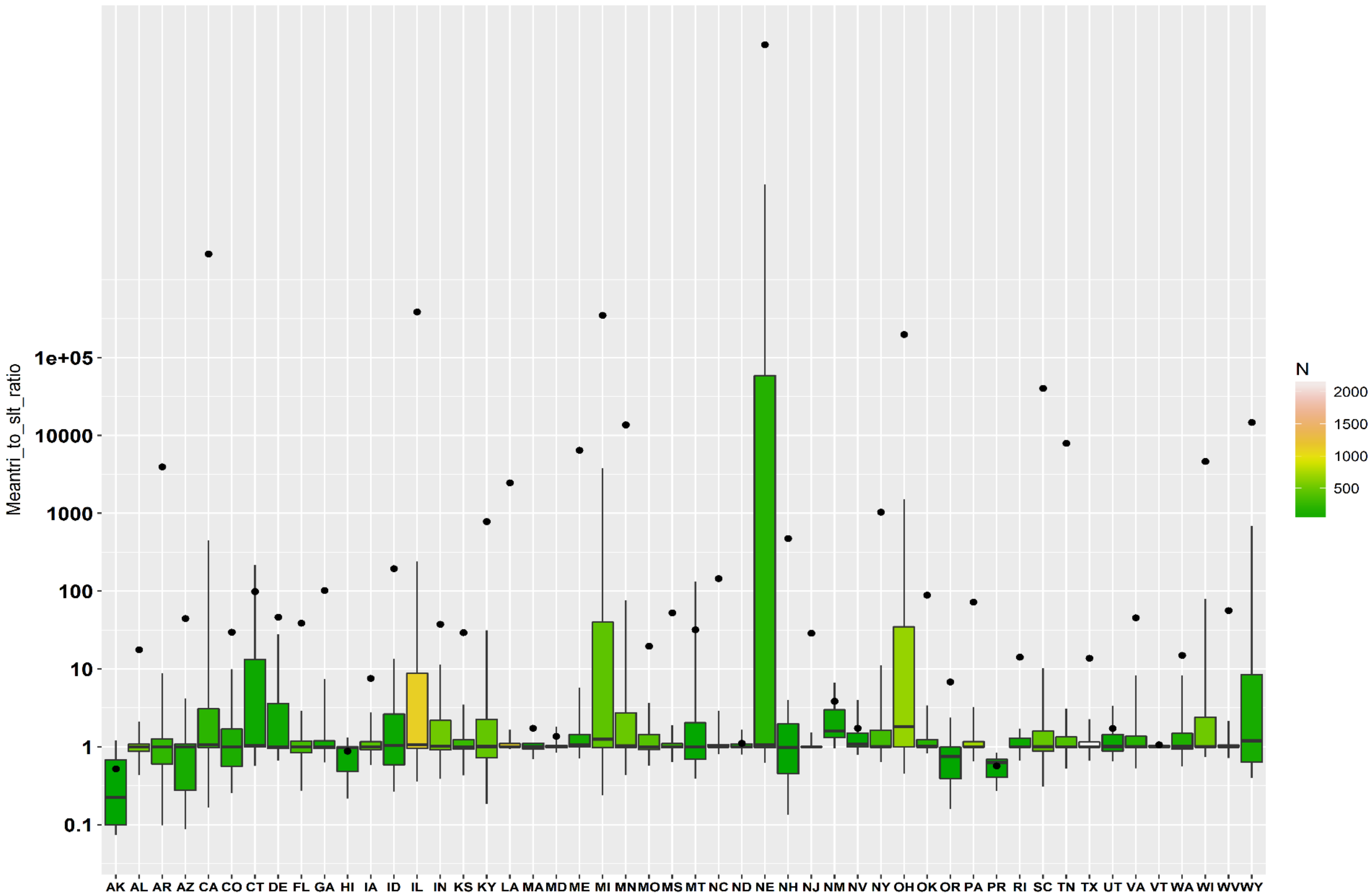
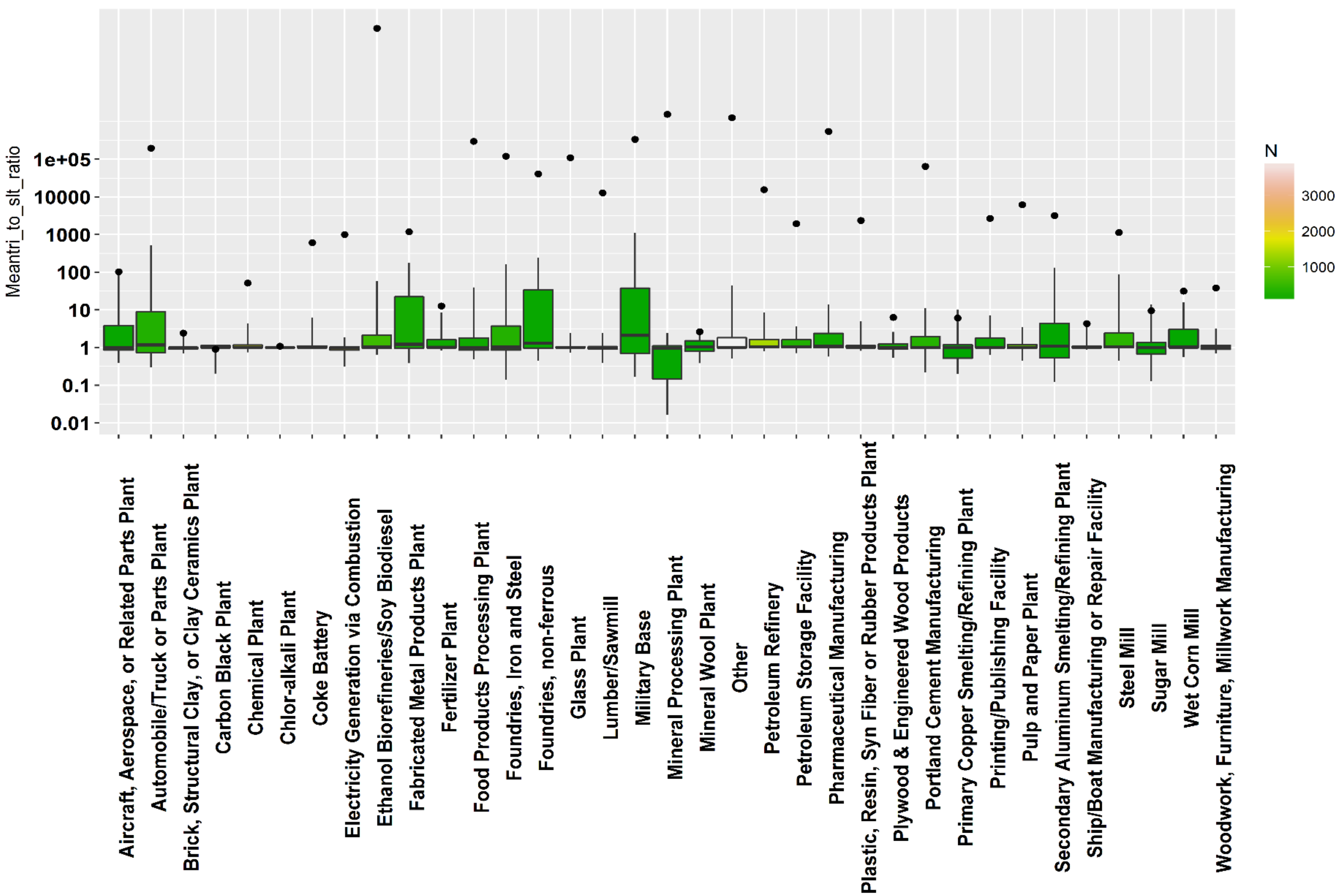


Figure 7. Percentile Distribution and mean TRI/NEI ratios by facility type. N=number of records.


Meantri_to_slt_ratio
1e+05
10000
1000
100
10
1
0.1
0.01
N
3000
2000
1000
Aircraft, Aerospace, or Related Parts Plant
Automobile/Truck or Parts Plant
Brick, Structural Clay, or Clay Ceramics Plant
Carbon Black Plant
Chemical Plant
Chlor-alkali Plant
Coke Battery
Electricity Generation via Combustion
Ethanol Biorefineries/Soy Biodiesel
Fabricated Metal Products Plant
Fertilizer Plant
Food Products Processing Plant
Foundries, Iron and Steel
Foundries, non-ferrous
Glass Plant
Lumber/Sawmill
Military Base
Mineral Processing Plant
Mineral Wool Plant
Other
Petroleum Refinery
Petroleum Storage Facility
Pharmaceutical Manufacturing
Plastic, Resin, Syn Fiber or Rubber Products Plant
Plywood & Engineered Wood Products
Portland Cement Manufacturing
Primary Copper Smelting/Refining Plant
Printing/Publishing Facility
Pulp and Paper Plant
Secondary Aluminum Smelting/Refining Plant
Ship/Boat Manufacturing or Repair Facility
Steel Mill
Sugar Mill
Wet Corn Mill
Woodwork, Furniture, Millwork Manufacturing

Comparison of Release Point Ratios

The flags set during the release point analysis were used to focus on records where the stack and fugitive emission values were different while the facility total emissions were deemed to be nearly the same. Out of a total of 4797 observations where the total emissions were comparable, there were 1300 records (approx. 27%) which were flagged as having noticeable differences between the two data sets when looking at how emissions were allocated to stack and fugitive releases.

Using the flagged records, we counted the number of records for a few metrics (pollutant, NAICS & state) to see if there were certain areas that saw more records flagged than others. Looking at the tables below we can see that some areas did have a much higher frequency of flagged records than others. While these do not suggest any wholesale fixes, it does highlight some areas that need further exploration. For example, looking at the frequency of flagged records by pollutant, we can see that four pollutants each had 100+ instances where the record was flagged. This could signify differences in emission factors being used by those reporting to TRI and NEI. The tables for NAICS and states add support to this idea.

Table 6. Release Point differences by pollutant – flagged records

Pollutant Code	Pollutant	Pollutant Count	Total records (with comparable emissions)
67561	Methanol	107	292
xylenes	Xylenes	107	222
108883	Toluene	104	222
100425	Styrene	103	273
NH3	NH3	78	336
100414	Ethyl Benzene	68	133
7439921	Lead	57	301
110543	Hexane	54	126
108952	Phenol	37	91
91203	Naphthalene	37	88
71432	Benzene	35	93
7440020	Nickel	34	112
7439965	Manganese	33	162
75070	Acetaldehyde	33	111
108101	Methyl Isobutyl Ketone	32	66
107211	Ethylene Glycol	29	71
50000	Formaldehyde	20	106
7647010	Hydrochloric Acid	20	357

Table 7. Release Point differences by NAICS – flagged records

NAICS Description	NAICS count	Total records (with comparable emissions)
Petroleum Refineries	125	366
All Other Basic Organic Chemical Manufacturing	107	293
Plastics Material and Resin Manufacturing	87	274
Paint and Coating Manufacturing	59	109

Iron and Steel Mills and Ferroalloy Manufacturing	57	126
Petroleum Bulk Stations and Terminals	56	96
Petrochemical Manufacturing	43	391
Paper (except Newsprint) Mills	36	156
All Other Miscellaneous Chemical Product and Preparation Manufacturing	34	92
Other Basic Inorganic Chemical Manufacturing	30	144
Cement Manufacturing	24	101
Boat Building	21	62
Paperboard Mills	20	75
All Other Plastics Product Manufacturing	19	59
Iron Foundries	19	42
Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	19	35
Steel Foundries (except Investment)	19	29
Other Basic Organic Chemical Manufacturing	16	21

Table 8. Release Point differences by State – flagged records

State Abbr	State Fips	State Count	Total records (with comparable emissions)
NJ	34	223	265
LA	22	125	540
PA	42	97	287
IL	17	80	193
AL	01	77	186
TX	48	64	841
WV	54	59	157
NC	37	54	292
KS	20	40	81
CA	06	36	43
IN	18	34	116
MN	27	34	121
SC	45	34	95
WI	55	34	198
NY	36	33	99
TN	47	31	131
MS	28	29	111
MI	26	24	90

In addition to pollutants, NAICS and states, we also looked at counts for the following scenarios of flagged records:

- TRI fugitive emissions = 0 (192 records)

- o 109 of these have NEI stack emissions = 0. This implies that the TRI stack emissions are very close to the NEI fugitive emissions. The reported values appear to be reported completely to the wrong release type for one of the systems.
- o 83 of 192 records have values for NEI stack and fugitive emissions. This implies that the states split the emissions for NEI reporting.

- TRI stack emissions = 0 (60 records)
  - o 48 of these records have NEI fugitive emissions = 0. This implies that TRI fugitive emissions closely lines up with NEI stack emissions. This brings up the thought that emissions could have been reported wrong to one or both systems.
  - o Remaining 12 records have NEI fugitive and stack values not equal to 0. This implies that states split the emissions when reporting for NEI.
- NEI fugitive emissions = 0 (328 records)
  - o There were no cases here where emissions from TRI fugitive were zero. This implies that industry split the emissions between stack and fugitive for TRI but states reported everything as stack emissions for NEI.
  - o 15 of the 328 records had TRI stack emissions = 0. This case had NEI stack emissions very close to TRI fugitive emissions which implies that emissions were reported incorrectly to one or both system.
- NEI stack emissions = 0 (429 records)
  - o Similar to when NEI fugitive emissions = 0. Most of these cases had both fugitive and stack emissions for TRI which implies that industry split emissions for their TRI reporting while states reporting to NEI reported most of their emissions as fugitive.
- The remaining records follow similar cases where either values for fugitive and stack are almost completely swapped from one data system to the next or portions of fugitive and stack is not the same from TRI to NEI.

Attachment– TRI-to NEI Ratios for 2014

Table 1: TRI-to-NEI Ratios by State

state	10th	25th	50th	75th	90th	Mean	# data points	Minimum	Maximum
AK	0.07	0.10	0.23	0.68	1.20	0.5	5	0.057	1.55
AL	0.44	0.89	1.00	1.10	2.14	19	492	0.0005	6,539
AR	0.10	0.67	1.00	1.26	9.27	4,120	244	7.7E-07	999,355
AZ	0.09	0.29	1.00	1.09	4.18	48	83	0.0004	3,450
CA	0.14	0.82	1.02	2.57	364.38	2,329,569	205	4.0E-05	468,006,188
CO	0.26	0.60	1.00	1.62	6.73	31	110	0.016	2,006
CT	0.60	1.00	1.03	14.07	237.39	6,912	43	0.0004	292,756
DE	0.67	0.98	1.00	3.87	29.56	49	50	0.009	1,485
FL	0.27	0.83	1.00	1.17	2.69	18	314	0.009	1,840
GA	0.35	0.95	1.00	1.48	53.80	339	58	0.047	8,333
HI	0.22	0.48	0.98	1.01	1.31	0.9	27	0.069	3.69
IA	0.50	0.91	1.00	1.14	2.60	7.5	414	0.001	2,000
ID	0.27	0.59	1.04	2.64	13.51	195	36	0.003	6,830

IL	0.32	0.95	1.05	4.52	210.66	418,881	1007	0.0003	367,647,059
IN	0.41	0.94	1.02	2.07	12.64	32	456	0.0002	6,153
KS	0.45	0.95	1.00	1.16	2.90	27	253	0.001	3,105
KY	0.20	0.72	1.01	2.35	30.57	774	443	0.0001	115,079
LA	0.91	1.00	1.00	1.10	1.63	28	1029	0.005	20,410
MA	0.31	0.91	1.00	1.11	1.44	1.6	13	0.169	9.85
MD	0.87	0.96	1.00	1.02	1.12	1.0	47	0.327	2.56
ME	0.48	1.00	1.06	1.41	3.96	6,628	85	0.021	563,085
MI	0.22	0.98	1.19	36.90	11920	531,509	416	0.0002	70,500,000
MN	0.44	0.98	1.02	2.31	51.67	11,971	462	1.0E-05	4,437,704
MO	0.53	0.89	1.00	1.45	4.18	21	392	0.004	3,583
MS	0.70	0.99	1.00	1.10	1.99	56	246	0.026	13,335
MT	0.34	0.68	0.91	2.23	153.75	34	14	0.204	243
NC	0.64	0.99	1.00	1.06	2.85	186	546	0.0001	66,667
ND	0.66	0.97	1.00	1.09	1.64	1.1	64	0.077	3.00
NE	0.63	0.98	1.04	50000	10493800	801,059,303	157	0.002	36,140,000,000
NH	0.13	0.45	0.99	1.97	4.00	474	11	0.067	5,198
NJ	1.00	1.00	1.00	1.00	1.62	31	318	0.042	6,559
NM	1.00	1.22	1.63	3.01	6.45	3.8	38	0.357	37
NV	0.79	1.00	1.08	1.50	4.02	1.7	9	0.162	5.03
NY	0.53	0.98	1.00	1.34	10.19	4,893	303	0.001	1,240,000
OH	0.45	0.99	1.82	34.18	2248	189,634	614	0.002	81,674,959
OK	0.89	1.00	1.01	1.32	3.82	122	204	0.0002	15,119
OR	0.16	0.39	0.75	0.99	2.37	6.8	12	0.049	74
PA	0.63	0.99	1.00	1.10	2.63	74	678	0.001	31,935
PR	0.27	0.40	0.63	0.69	0.84	0.6	5	0.183	0.94
RI	0.70	0.99	1.00	1.28	1.65	3.1	40	0.256	55
SC	0.31	0.89	1.01	1.60	12.18	42,349	467	0.003	19,550,165
TN	0.41	0.98	1.00	1.28	2.76	8,090	380	0.001	3,036,927
TX	0.60	0.99	1.00	1.14	2.27	15	2101	0.0004	9,400
UT	0.65	0.88	1.01	1.44	3.35	1.7	30	0.287	8.64
VA	0.54	0.98	1.00	1.26	4.72	46	170	0.0005	3,989
VT	1.00	1.00	1.00	1.01	1.24	1.1	7	0.999	1.58
WA	0.57	0.95	1.02	1.68	9.84	36	142	0.028	3,007
WI	0.77	1.00	1.01	1.82	47.84	4,965	472	0.0002	900,000
WV	0.77	1.00	1.00	1.03	1.47	61	284	0.003	9,174
WY	0.32	0.58	1.21	13.51	141	9,247	87	0.002	713,355

Table 2: TRI-to-NEI Ratios by Facility Type

type	10th	25th	50th	75th	90th	Mean	# data points	Minimum	Maximum
OTHER	0.49	0.98	1.00	1.63	22.57	1372926	3670	0.0	4130000000
Aircraft, Aerospace, or Related Parts Plant	0.49	0.88	1.00	3.16	107.81	127	52	0.0	2398

Alumina Refinery	1.02	1.04	1.08	1.91	2.42	1.61	3	1.0	3
Auto Body, Painting, or Repair Shop	0.98	0.98	0.98	0.98	0.98	0.98	1	1.0	1
Automobile/Truck or Parts Plant	0.28	0.71	1.15	16	1433	449890	275	0.0	62573099
Bakeries	1.00	1.00	1.00	1.00	1.00	1.00	1	1.0	1
Battery Plant	0.74	0.99	1.00	1.30	2.16	1.30	17	0.2	4
Breweries/Distilleries/Wineries	0.27	0.70	0.95	2.48	6.01	2.40	12	0.0	12
Brick, Structural Clay, or Clay Ceramics Plant	0.64	0.92	1.00	1.00	2.49	2.55	87	0.0	76
Calcined Pet Coke Plant	0.29	0.39	0.89	1.05	2.10	1.29	22	0.0	11
Carbon Black Plant	0.27	1.00	1.00	1.13	1.18	0.93	42	0.0	1
Carbon or Graphite Plant	0.57	0.98	13.05	45	75.79	209	23	0.4	3755
Chemical Plant	0.72	1.00	1.00	1.16	4.47	748	1617	0.0	670352
Chlor-alkali Plant	0.95	1.00	1.01	1.02	1.16	1.08	49	0.1	4
Coke Battery	0.82	1.00	1.00	1.10	24.71	5607	97	0.1	326816
Concrete Batch Plant	198	231	286	296	301.58	256	3	176.3	305
Electricity Generation via Combustion	0.28	0.84	1.00	1.03	1.70	1059	1782	0.0	1775148
Ethanol Biorefineries/Soy Biodiesel	0.65	0.96	1.03	2.07	59.82	212883818	571	0.0	36140000000
Fabricated Metal Products Plant	0.53	0.96	1.05	12.49	166.51	301.07	136	0.0	11470
Ferroalloy Plant	0.25	0.93	1.02	1.09	12.97	440.65	21	0.1	9174
Fertilizer Plant	0.88	1.00	1.02	1.52	7.98	12.88	98	0.0	423
Food Products Processing Plant	0.48	0.86	1.00	2.00	54.17	286194	122	0.0	34750000
Foundries, Iron and Steel	0.10	0.82	1.01	2.04	35.14	130994	268	0.0	33611670
Foundries, non-ferrous	0.46	0.97	1.13	13.12	235.47	46456	66	0.0	3036927
Gasoline/Diesel Service Station	1137949	2453696	4646608	6839520	8155268	4646608	2	260784	9032432
Glass Plant	0.72	0.98	1.00	1.04	3.25	115876	75	0.3	8683620
Gold Mine or Processing Facility	0.16	0.16	0.16	0.16	0.16	0.16	1	0.2	0
Hot Mix Asphalt Plant	10.08	25.14	50.22	182.63	262.08	121.77	3	0.0	315
Industrial Machinery or Equipment Plant	1.00	1.00	4.71	221.41	19063.05	7362.41	15	1.0	76815
Institutional (school, hospital, prison, etc.)	18	43	77	305	679	271	4	1.8	929
Lumber/Sawmill	0.37	0.92	1.00	1.06	2.43	13021	77	0.0	999355
Military Base	0.14	0.74	2.11	38.61	1130.41	351194	57	0.0	20000000
Mineral Processing Plant	0.02	0.14	0.96	1.06	1.60	1856250	44	0.0	81674959
Mineral Wool Plant	0.37	0.82	1.03	1.36	2.37	1.21	36	0.0	4
Mines/Quarries	0.11	0.33	1.00	2.10	12.24	159.95	24	0.0	3450
Municipal Waste Combustor	0.61	0.86	1.02	2.65	5.56	2.49	4	0.4	8
Munition or Explosives Plant	0.02	0.31	0.69	1.00	2.04	8.59	17	0.0	134
Petroleum Refinery	0.76	1.00	1.06	1.80	9.95	13729.02	1407	0.0	16289294
Petroleum Storage Facility	0.72	1.00	1.04	1.59	3.44	1998.36	285	0.1	563085
Pharmaceutical Manufacturing	0.64	1.00	1.12	2.34	16.82	564106.67	125	0.0	70500000
Plastic, Resin, Syn Fiber or Rubber Products Plant	0.82	0.99	1.00	1.11	3.76	2545.09	581	0.0	900000
Plywood & Engineered Wood Products	0.54	0.93	1.00	1.26	2.57	6.22	140	0.2	243
Portland Cement Manufacturing	0.22	0.93	1.00	1.82	11	69919	319	0.0	19550165
Primary Aluminum Plant	0.57	0.93	1.01	4.50	1223	42737	30	0.0	1240000
Primary Copper Smelting/Refining Plant	0.23	0.61	1.00	1.08	5.94	5.85	25	0.0	106
Primary Lead Smelting Plant	1.09	1.09	1.09	1.09	1.09	1.09	1	1.1	1
Primary Non-ferrous Metal Smelting/Refining Plant (not Lead, Gold, Aluminum, or Copper)	1.00	1.00	1.00	1.05	1.25	46.42	14	1.0	636
Printing/Publishing Facility	0.63	0.99	1.00	1.76	7.11	2678	71	0.1	189850
Pulp and Paper Plant	0.44	0.97	1.00	1.23	3.75	6601	908	0.0	4913799
Secondary Aluminum Smelting/Refining Plant	0.12	0.55	1.08	3.29	46	2889	31	0.0	89045
Secondary Copper Smelting/Refining Plant	0.28	1.00	1.35	37.06	134	79.93	14	0.1	801

Secondary Lead Smelting Plant	0.48	0.99	1.00	1.14	1.54	1.67	19	0.3	14
Secondary Non-ferrous Metal Smelting/Refining Plant (not Lead, Aluminum, or Copper)	0.03	0.50	1.00	1.15	3.30	19.96	22	0.0	215
Ship/Boat Manufacturing or Repair Facility	0.88	0.99	1.00	1.07	3.28	3.99	199	0.2	172
Steam/Heating Facility	0.40	0.99	1.01	1.13	7.96	5.47	10	0.2	44
Steel Mill	0.55	0.99	1.05	2.51	109	1386	342	0.0	202364
Sugar Mill	0.13	0.69	1.00	1.70	39	26.30	44	0.02	746
Textile, Yarn, or Carpet Plant	1.02	1.05	2.56	37.84	99	36.33	4	1.0	139
Wastewater Treatment Facility	0.43	1.00	1.00	1.00	1.01	0.81	5	0.0	1
Wet Corn Mill	0.57	1.00	1.02	3.02	15.81	31.74	48	0.1	797
Woodwork, Furniture, Millwork Manufacturing	0.70	0.90	1.00	1.15	2.64	41.73	45	0.3	1814

Table 3: TRI-to-NEI Ratios by Pollutant

Pollutant	10th	25th	50th	75th	90th	Mean	# data points	Minimum	Maximum
1,1,2-Trichloroethane	1.00	1.01	1.03	1.39	1.75	1.5	14.0	0.368	5.9
1,1,2,2-Tetrachloroethane	0.85	0.97	1.00	1.01	1.10	1.0	10.0	0.412	1.8
1,2-Epoxybutane	0.90	0.97	1.07	1.44	1.98	1.3	4.0	0.846	2.3
1,2-Propylenimine	1.11	1.11	1.11	1.11	1.11	1.1	1.0	1.105	1.1
1,2,4-Trichlorobenzene	0.54	0.83	1.00	41.20	113.54	41.0	4.0	0.351	162
1,3-Butadiene	0.83	1.00	1.05	1.51	6.38	1861	129	0.004	222852
1,3-Dichloropropene	1.00	1.00	1.00	1.28	1.45	1.2	3.0	1.000	1.6
1,4-Dichlorobenzene	0.23	0.36	0.72	1.00	1.00	0.6	4.0	0.144	1.0
2-Nitropropane	1.06	1.16	1.31	1.47	1.56	1.3	2.0	1.000	1.6
2,4-Dinitrotoluene	6.15	6.15	6.15	6.15	6.15	6.2	1.0	6.154	6.2
2,4-Toluene Diisocyanate	0.56	0.65	0.74	0.94	1.23	0.9	4.0	0.500	1.4
2,4,5-Trichlorophenol	3.33	3.33	3.33	3.33	3.33	3.3	1.0	3.333	3.3
2,4,6-Trichlorophenol	0.42	0.42	0.42	0.42	0.42	0.4	1.0	0.417	0.4
4,4 -Methylenedianiline	0.57	0.84	0.99	1.06	1.17	0.9	6.0	0.361	1.3
Acetaldehyde	0.89	1.00	1.01	1.30	18.01	74698	310	0.027	19550165
Acetonitrile	0.38	0.98	1.00	1.05	3.69	5733	48	0.133	275000
Acetophenone	1.00	1.00	1.01	1.04	1.14	3.0	11	1.000	23
Acrolein	0.84	0.99	1.01	2.60	70.54	215073	82	0.372	17238739
Acrylamide	0.95	1.00	1.11	4.08	41354.70	9386	12	0.918	66667
Acrylic Acid	0.51	0.84	1.01	1.44	2.67	2.1	52	0.085	29
Acrylonitrile	0.96	1.00	1.01	1.15	2.67	4.3	42	0.013	106
Allyl Chloride	0.80	1.00	1.00	1.02	1.26	1.0	9.0	0.009	1.4
Ammonia	0.31	0.98	1.00	1.29	6.30	38565	915	0.000	34750000
Aniline	0.62	1.00	1.00	1.02	2.75	918	18	0.008	16500
Anthracene	1.00	1.00	16.83	177.98	186109.83	42655	15	0.781	326816
Antimony	0.23	0.71	1.00	1.69	2.91	4.3	51	0.000	139
Arsenic	0.13	0.71	1.00	1.08	1.53	1.4	96	0.016	21
Asbestos	1.01	1.01	1.03	1.04	1.05	1.0	2.0	1.000	1.1
Benzene	0.53	0.98	1.02	1.43	8.33	4814	387	0.001	975519
Benzo[g,h,i,]Perylene	0.06	1.01	46.04	12193.73	102456.06	65139	40	0.002	1240000
Benzyl Chloride	1.00	1.01	1.06	2.46	4.16	2.0	8.0	1.000	4.8
Beryllium	0.96	1.02	1.23	2.84	15.24	8.7	24.0	0.001	95
Biphenyl	0.68	0.99	1.00	1.19	13.91	25.7	42.0	0.003	895
Bis(2-Ethylhexyl)Phthalate	0.53	0.91	1.00	1.10	1.63	3.4	11.0	0.146	28
Bromoform	1.00	1.00	1.00	1.00	1.00	1.0	1.0	1.000	1.0
Cadmium	0.15	0.90	1.25	2.80	16.36	14.6	19.0	0.028	215
Captan	0.37	0.37	0.37	0.37	0.37	0.4	1.0	0.373	0.37
Carbon Disulfide	0.92	1.00	1.00	1.21	1.88	8.1	62	0.171	188
Carbon Tetrachloride	1.00	1.00	1.01	1.14	3.39	10.0	24	0.458	203
Carbonyl Sulfide	0.68	1.00	1.00	1.04	1.93	11.9	59	0.135	588
Catechol	1.13	1.19	1.28	1.37	1.43	1.3	2.0	1.095	1.5
Chlorine	0.30	0.94	1.00	1.01	1.79	12.6	185	0.000	1398
Chloroacetic Acid	0.32	0.70	0.96	1.06	1.16	0.8	4.0	0.060	1.2
Chlorobenzene	0.91	1.00	1.05	2.86	27.22	5262	28	0.004	147000
Chloroform	0.98	1.00	1.01	1.70	13.62	4379	39	0.432	167000
Chloroprene	0.86	0.93	0.98	1.05	1.14	1.0	4.0	0.821	1.2
Cobalt	0.39	0.99	1.14	5.16	168.66	1676	117	0.000	99580
Cresol/Cresylic Acid (Mixed Isomers)	0.83	1.00	1.00	1.32	4.62	395	79	0.001	31000
Cumene	0.57	0.99	1.01	1.46	11.56	29	118	0.006	2592
Dibenzofuran	1.00	1.00	1.01	1.04	941.78	315	6	0.994	1883
Dibutyl Phthalate	0.28	0.72	1.01	1.02	640000.61	228572	7	0.047	1600000
Dichloroethyl Ether	1.04	1.09	1.17	1.25	1.30	1.2	2	1.006	1.3
Diethanolamine	0.44	0.99	1.00	1.08	18.17	77540	34	0.058	2635750
Diethyl Sulfate	1.03	1.08	1.14	54.38	150.15	54	4	1.003	214
Dimethyl Phthalate	0.51	0.84	1.00	1.09	1.31	1.0	17	0.500	2.2
Dimethyl Sulfate	0.92	0.99	1.20	13.01	25.00	8	7	0.826	29
Epichlorohydrin	0.43	0.99	1.00	1.01	40.88	254	19	0.009	4667
Ethyl Acrylate	0.61	0.98	1.00	1.21	2.96	2.6	22	0.042	32

Ethyl Benzene	0.73	1.00	1.02	1.65	6.07	3966738	449	0.008	1730000000
Ethyl Chloride	0.62	1.00	1.00	1.16	9.98	7.3	25	0.079	122
Ethylene Dibromide	1.02	1.06	1.13	1.19	1.23	1.1	2.0	0.997	1.3
Ethylene Dichloride	0.94	1.00	1.03	2.24	27.04	3318	24	0.379	79500
Ethylene Glycol	0.46	1.00	1.00	1.55	13.74	24881963	166	0.009	4130000000
Ethylene Glycol Methyl Ether	0.10	0.25	0.50	0.75	0.90	0.5	2.0	0.005	1.0
Ethylene Oxide	0.89	1.00	1.00	1.14	2.61	5.0	60	0.373	122
Ethylene Thiourea	5.63	5.63	5.63	5.63	5.63	5.6	1	5.625	5.6
Ethylidene Dichloride	0.99	1.00	1.00	1.45	3.64	1.8	11	0.977	5.7
Formaldehyde	0.58	0.92	1.00	1.52	11.69	42786575	365	0.002	8580000000
Hexachlorobenzene	0.98	0.99	1.00	1.00	1.77	1.4	9.0	0.973	4.2
Hexachlorobutadiene	0.48	0.95	1.00	1.02	1.12	0.9	5.0	0.161	1.2
Hexachlorocyclopentadiene	1.05	1.05	1.05	1.05	1.05	1.0	1.0	1.047	1.0
Hexachloroethane	0.74	0.97	1.00	1.00	1.07	0.9	6.0	0.513	1.1
Hexane	0.61	0.96	1.01	1.49	4.37	109236497	527	0.006	36140000000
Hydrazine	0.55	0.87	0.98	1.19	17.59	7.6	8	0.010	55
Hydrochloric Acid	0.60	0.98	1.00	1.03	1.76	16.7	711	0.000	6559
Hydrogen Fluoride	0.42	0.92	1.00	1.00	1.14	4.3	410	0.000	1025
Hydrogen Sulfide	0.91	1.00	1.16	2.22	28.48	16.9	97	0.048	621
Hydroquinone	1.00	1.00	1.00	2.44	3.61	5.5	11	0.962	45
Lead	0.17	0.70	1.00	1.45	14.67	26179	1357	0.000	31000000
m-Cresol	1.00	1.00	1.00	1.00	1.00	1.0	1	0.997	1.0
m-Xylene	1.13	1.32	2.58	7.65	14.70	6.4	4	1.000	19
Maleic Anhydride	0.83	1.00	1.01	1.21	6.33	3.2	49	0.558	42
Manganese	0.27	0.97	1.04	3.41	247.98	31481	763	0.001	13675334
Mercury	0.54	0.98	1.00	1.21	4.75	148533	565	0.000	81674959
Methanol	0.63	0.98	1.00	1.15	2.57	49437478	777	0.006	15010000000
Methyl Bromide	0.89	0.94	1.00	1.11	3.04	2	9	0.881	8
Methyl Chloride	0.84	0.99	1.00	1.02	1.32	1	36	0.238	4
Methyl Chloroform	0.26	0.98	1.00	1.05	24.08	11	17	0.005	105
Methyl Iodide	1.00	1.00	1.00	1.03	1.29	1.1	6	1.000	2
Methyl Isobutyl Ketone	0.44	0.95	1.00	1.17	3.04	2330	174	0.021	405000
Methyl Isocyanate	1.81	3.45	6.19	8.93	10.57	6	2	0.714	12
Methyl Methacrylate	0.74	0.99	1.00	1.05	3.36	19	120	0.037	1660
Methyl Tert-Butyl Ether	0.57	1.00	1.00	1.20	5.71	4209	33	0.031	138000
Methylene Chloride	0.61	0.98	1.00	1.57	4.32	13	97	0.000	636
Methylhydrazine	30.00	30.00	30.00	30.00	30.00	30	1.0	30.000	30
N,N-Dimethylformamide	0.65	0.99	1.00	1.01	1.62	1606	45	0.142	46000
Naphthalene	0.56	1.00	1.07	6.42	352.85	161874	360	0.004	33611670
Nickel	0.31	0.98	1.09	10.09	198.93	12807	573	0.002	4437704
Nitrobenzene	0.72	1.00	1.00	1.00	1.02	0.9	9.0	0.345	1
o-Anisidine	1.00	1.00	1.00	1.00	1.00	1.0	1.0	1.000	1
o-Toluidine	1.00	1.00	1.05	1.21	1.40	1.2	4.0	1.000	2
o-Xylene	1.00	1.08	1.36	1.84	4.38	3.7	10	1.000	24
p-Dioxane	0.81	1.00	1.00	1.15	6.60	36.6	25	0.500	861
p-Phenylenediamine	0.58	0.74	1.00	1.00	1.00	0.8	3.0	0.473	1
p-Xylene	0.83	0.95	1.11	1.54	2.15	1.4	4.0	0.748	3
PAH, total	0.01	0.04	0.41	1.04	12.46	533	119	0.000	21689
Pentachlorophenol	0.81	0.88	1.00	3.50	5.00	2.6	3.0	0.757	6
Phenanthrene	0.99	1.00	2.01	298.27	4690.91	6818	28	0.392	110812
Phenol	0.76	1.00	1.00	1.54	12.20	22406	256	0.008	4913799
Phosgene	0.98	1.00	1.02	1.42	5.53	21	11	0.843	213
Phosphorus	1.00	1.00	1.00	1.00	1.00	1.0	2.0	0.997	1.0
Phthalic Anhydride	0.97	1.00	1.01	1.20	5.96	12.6	32	0.397	230
Polychlorinated Biphenyls	0.01	0.01	0.01	0.01	0.01	0.01	1.0	0.010	0.01
Propionaldehyde	0.98	1.00	1.00	1.01	4.09	13.1	20	0.178	237
Propylene Dichloride	0.46	0.58	0.90	1.00	1.00	0.8	6.0	0.421	1.0
Propylene Oxide	0.44	0.98	1.00	1.06	1.46	6.8	50	0.020	167
Quinoline	0.83	1.00	1.00	1.00	2.42	1.4	5.0	0.714	3.4
Selenium	0.54	0.97	1.00	1.02	1.88	177218	49	0.031	8683620
Styrene	0.84	1.00	1.00	1.06	1.79	859124	545	0.023	468006188
Tetrachloroethylene	0.44	1.00	1.00	1.11	4.52	1084637	65	0.001	70500000
Titanium Tetrachloride	0.42	0.88	1.00	1.01	743.00	248	6	0.004	1485

Toluene	0.70	0.99	1.02	1.73	50.06	5541898	822	0.007	4180000000
Toluene-2,4-Diamine	0.65	0.72	0.83	0.95	1.02	0.8	2.0	0.602	1.1
Trichloroethylene	0.97	1.00	1.00	1.31	6.40	1542	65	0.379	93000
Triethylamine	0.58	1.00	1.00	1.18	7.15	368	31	0.231	11245
Trifluralin	0.38	0.38	0.38	0.38	0.38	0.38	1.0	0.377	0.38
Vinyl Acetate	0.54	1.00	1.00	1.23	1.80	1.2	60	0.041	6.1
Vinyl Chloride	0.98	1.00	1.02	1.10	2.13	2.2	26	0.730	26
Vinylidene Chloride	0.93	1.00	1.01	1.79	44.06	109	15	0.637	1552
Xylenes (Mixed Isomers)	0.54	0.98	1.00	1.67	7.93	5817098	709	0.003	4030000000

APPENDIX C: Case Studies Exploring Differences in TRI and SLT/NEI Emissions Reporting

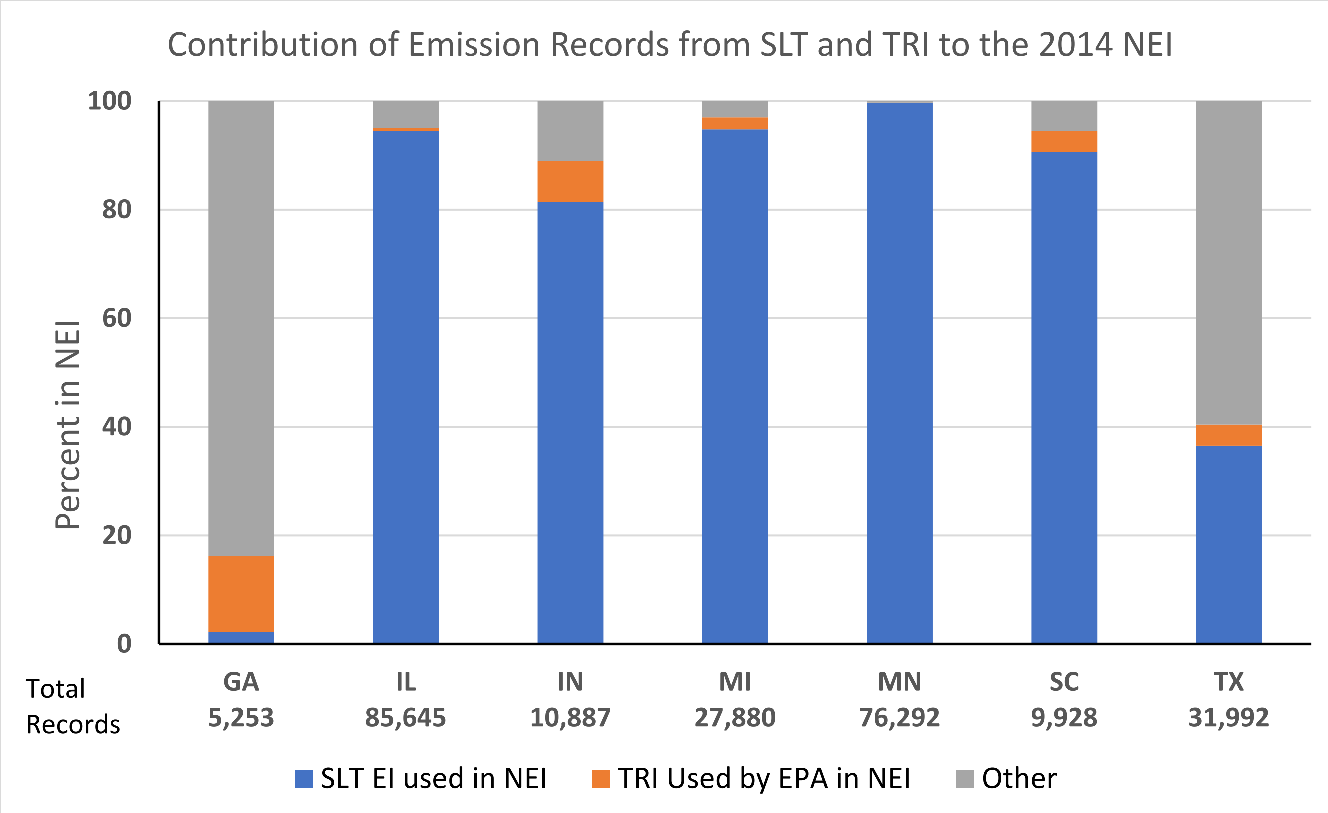
Case Studies Exploring Differences in TRI and SLT/NEI Emissions Reporting

INTRODUCTION

As part of the CAER SLT/NEI/TRI R&D Phase II project, the team conducted a series of case studies to determine the differences in the emissions reporting and to better understand the reasons for these differences. Case studies focused on Georgia, Michigan, Minnesota, South Carolina, Texas, and EPA.

The figure below shows the contribution of emission records from the above SLTs and TRI to the NEI. This figure also includes the information for IL and IN. These two states, along with Minnesota, have used TRI data in their NEI data submission according to the survey results presented in Phase I of this project.

Contents



To facilitate the selection of case studies, the team analyzed those SLT data used in the 2014 NEI V2 that also had 2014 TRI emissions. Differences between emissions of SLT/NEI and TRI were ranked by NAICS codes and by facilities. Large discrepancies (high ranking) within NAICS codes and facilities may be considered for case studies.

The sections below provide a summary of the case study findings, explore the reasons for the differences in the emissions reporting, and formulate recommendations moving forward.

SUMMARY OF FINDINGS

Case studies from Georgia, Michigan, Minnesota, South Carolina, Texas, and EPA, and with comments from others (FL) indicated the following common causes of emission differences between NEI/SLT or NEI/EPA-OAQPS EIs and EPA's TRI. Please note the case studies were only conducted for the emissions in both SLT EIs/NEI and TRI. SLT EIs/NEI have many more emissions that are not subject to report to TRI.

1. Different emission factors are used for different programs. For example, a facility might use one set of emissions factors (AP-42/WebFIRE) for a state emissions inventory and another set of emissions factors, such as Electrical Power Research Institute (EPRI), for TRI. One set of emission factors may not be updated as frequently as the others. It was very interesting to observe a trade association's document that specified different sets of emission factors for TRI and SLT EIs for the same industrial process depending on the reporting program.
2. Different processes are covered in different programs. For example, air emissions from fugitive types of processes and insignificant activities are estimated by facilities for TRI but may not be included in all SLT EIs/NEI.
3. Different reporting thresholds are used in different programs. TRI requires facilities to report only if they process or use more than a certain amount of a TRI toxic chemical per year, with de minimis % limits and

qualifiers. On the other hand, SLTs with mandatory reporting requirements set thresholds based on emissions, or no thresholds at all. Reporting thresholds do not exist for those SLTs that do not have mandatory reporting requirements. Once a TRI threshold is met, a chemical must be reported for all processes (other than some personal use, janitorial and mixture exemptions) at the facility whereas in many state programs, there are process-specific emission thresholds as opposed to facility-wide emission thresholds. This means that certain processes would not be required to be reported to a state but would be required to be reported to the TRI.

4. Different assumptions exist as to the control efficiency used in TRI emissions calculations vs. the control efficiency used in the SLT EIs/NEI calculations.
5. Different pollutant definitions are used in different programs. For example, certain glycol ethers in TRI includes butyl cellosolve (Cas No. 111-76-2), but it is not included in the NEI pollutant glycol ethers.
6. Different pollutant codes are allowed for one pollutant. For example, TRI lists hydrogen cyanide and cyanide compounds as an individual pollutant and a group of pollutants, respectively. Facilities report hydrogen cyanide as hydrogen cyanide to TRI. Although NEI accepts both emissions of hydrogen cyanide and cyanide, the Clean Air Act 112 B only lists cyanide compounds under the HAPs. Therefore, some SLTs report these emissions to NEI directly as hydrogen cyanide, while some STLs report hydrogen cyanide as cyanide to the NEI because facilities report hydrogen cyanide as cyanide to those SLTs.
7. Different mandatory reporting requirements exist in different programs. TRI is a national mandatory program for any facilities that are subject to the TRI report. However, a national mandatory program for HAP emission reporting to SLT EIs does not exist. HAP reporting requirements at a SLT level vary depending on jurisdictions. Many SLT EIs rely on facility voluntary reports, or may not have SLT HAP EIs at all. Therefore, HAP emissions could be missed for some states, or for processes that do not have WebFIRE/AP-42 emission factors.
8. SLT programs lack guidance for facilities reporting voluntarily. For those SLTs, a variety of technical guidance exists for permitting and compliance purposes. Facilities may use emissions at a worst-case scenario in the SLT EIs, resulting in higher emissions in the SLT EIs than in TRI. There is also lack of guidance for some required submissions, for example fugitive emissions reporting.
9. Different types of numerical values are allowed in different programs. SLT EIs/NEI only take discrete emission values. However, TRI can take discrete emission values and range codes for on-site releases <1000 lbs. Additionally, in the absence of more precise data, TRI allows emissions to be reported in two significant digits while most SLT EIs/NEI do not.
10. Different operating types are included in different programs. TRI data includes releases due to spills, upsets, maintenance, or other one-time events. While some SLTs may collect some non-routine emissions data, they may not include it in their EIs or report it to the NEI. This could result in significantly higher TRI emissions for a facility than in NEI for a given reporting year.
11. Differences between fugitive and stack emissions distribution were found when total emissions were almost the same. For the case studies which investigated these occurrences, it was found that the differences resulted from facility reporting errors.
12. One TRI facility could include multiple SLT EI facilities. These differences can be reconciled by adding emissions from the SLT EI facilities together before comparing to the TRI emissions.

RECOMMENDATIONS

1. TRI is a good information source for QA/QC of the SLT EIs and NEI and vice versa.
2. A prioritization schema based on both pollutant emissions difference and pollutant potential health impacts needs to be established when selecting cases for cross program QA/QC.

3. Facilities should always be contacted about the potential discrepancies before any changes are made to reported emissions. Although many causes for emission discrepancies were found in this study, other facility-specific circumstances need to be analyzed.
4. Due to numerous differences between the TRI and SLT EIs/NEI, automatic 'gap filling' of emissions leads to additional uncertainties in the estimates. Alternatives to reduce the need to gap fill, such as CAER, should be implemented. Prior to these solutions, automatic 'gap filling' of emissions may be useful for some SLT EIs/NEI, but should be done with care, recognizing the limitations identified by these case studies.
5. For NEI gap filling, it may not be appropriate to assume that state submitted HAPs or air toxics data should supersede the TRI reported values. Processes emitting criteria pollutants that potentially also emit HAPs but do not report HAP emissions should be looked at. Since HAPs reporting by facilities is not mandatory in many SLTs, SLT EIs may not collect or estimate emissions for processes without WebFIRE/AP-42 or state specific emission factors. Examples of such processes include solvent cleaning, surface coating, manufacturing fiberglass resin products, ethanol processes, and paper & pulp processes. Available emission factors are mainly for combustion processes.
6. TRI emissions are only for a facility in a TRI-covered industry sector or category with at least 10 full-time employees meeting reporting thresholds. However, the emissions could cover more processes than the processes covered by the requirements of state emission inventories for the facility. In order to account for those emissions not covered by SLT EIs/NEI, which usually consider permitted processes only, the SLT EIs or the future Combined Emission Form (CEF) should provide the structure for facilities to report those non-permitted emissions. For example, Minnesota created one dummy emission unit, EU000, for non-permitted emissions for air toxics. The emission unit could have multiple processes to represent emissions from additional TRI processes.
7. WebFIRE and AP-42 are the bases of emission factors for many SLT emission inventories. These factors should be up to date. For example, the EPRI and the National Council for Air and Stream Improvement (NCASI) frequently update emission factors for electric generating processes and pulp & paper, respectively. Effort needs to be taken on updating of the national emission factor repository with test data from EPRI, NCASI, and other sources.
8. Education, outreach, and technical guidance are necessary to increase the facilities' awareness and capability of more representatively estimating actual emissions. This should apply to both state emission inventories and TRI.
9. Clear definition of pollutants is needed, particularly for those pollutants that overlap but do not exactly match between current SLT EIs/NEI and TRI or that have been interpreted differently across programs. For example, some SLT programs treat CN as including HCN and some other programs, including the TRI, treat CN as not including HCN. As a result, the NEI contains HCN reported under CN or reported as HCN directly depending on where the NEI obtains emissions. The pollutant crosswalk in Phase I of this project identified those pollutants. The future CEF should have more explicitly defined pollutant codes to handle them.
10. For NEI gap filling, it may be better to use TRI than the 2010-MATS Emission Factors for EGU HAP estimates which may, at this time, be out of date due to changes in unit configurations made since 2010.

CASE STUDIES

EPA Case Study

1. Background Information

Industrial facilities covered by the TRI program are required to report to EPA's TRI if they meet reporting thresholds. Facilities that are covered by the TRI program must report on listed chemicals. This includes hydrochloric acid (HCl) aerosol releases if they are over the 25,000-lb. thresholds for manufactured or processed, or the 10,000-lb. threshold if otherwise used. The facilities explored here are coal fired power plants in Georgia. Georgia does not report these emissions to EPA as part of its state EI. These facilities have reported HCl aerosol releases consistently for several years to the TRI but these reported values were not used in the 2014 NEI. Instead the NEI values were estimated by EPA's Office of Air Quality Planning and Standards (OAQPS), the office responsible for developing the NEI.

EPA/OAQPS's NEI program collects emissions primarily from SLT air programs but also estimates emissions for numerous categories and uses them in the NEI for gap filling. Gap filling is important for HAPs because HAPs are not required to be submitted by SLTs. EPA/OAQPS estimates emissions for HCl from electric generating units (EGU) using activity from continuous monitoring data (heat input) collected from facilities by EPA's Clean Air Markets Division (CAMD). HCl was one of the HAPs for which EPA conducted an information collection request (ICR) in support of the Mercury and Air Toxics Standards. The ICR gathered 2010 test data that were used to develop unit-specific and "bin"-average emission factors from a 2010 information collection request in support of the Mercury and Air Toxics Standards. There were approximately 300 unit-specific emission factors developed for hydrochloric acid and 21-bin average emission factors that accounted for fuel type, boiler type and control scheme. These factors are not yet incorporated into WebFIRE but they have been used to estimate HAP emissions (for gap filling) since the 2008 NEI. In the hierarchy, EPA uses these EGU data ahead of TRI data for gap filling. This is because EGU data are at the process level and TRI data are only split between stack and fugitives and do not provide process-level information.

2. Case Study Selection

Two facilities in Georgia were selected for analysis. Both facilities were selected through a comparison (done by a CAER workgroup member) of the 2014 NEI to 2014 TRI releases. A large reporting discrepancy was found for reported HCl from these facilities which greatly exceeded the amounts that these facilities reported to the TRI for this pollutant.

3. Methods

EPA's NEI calculations were shared with the facilities and the facilities explained the basis for the differences.

4. Findings

	Facility / Process	Pollutant	TRI 2014 (lbs.)	NEI 2014 (lbs.)	Reasons for Difference
EPA	EGU/coal fired boilers	HCl	27,000	189,000	A
EPA	EGU/coal fired boilers	HCl	130,000	1040	B

For both facilities, the difference between EPA/OAQPS estimate for NEI and the number reported by them for TRI is due to the use of different methodologies and the use of site-specific fuel and pollution control data for the reporting year in their TRI reporting versus EPA's use of MATS-based emission factor 2010 data.

A - While the NEI HCl emission values that EPA has provided are calculated from a generic (average across similar units) MATS-based emission factor from 2010, this facility's TRI releases for HCl are calculated with the EPRI methodology. The EPRI method does take into account fuel constituents and evaluation of specific pollution control equipment/efficiency at the individual facility for the specific reporting year. In addition, for this plant, flue gas desulfurization (FGD) scrubbers were installed on all four units between 2011 and 2014. Therefore, the NEI calculation using a general MATS-based emission factor from 2010 would not be representative of the HCl emissions for the existing pollution control configuration in 2014.

B – The NEI HCl emission values that EPA has provided are calculated from a unit-specific MATS-based emission factor from 2010, and the TRI releases for HCl are calculated with the EPRI methodology. The EPRI method takes into account fuel constituents and evaluation of specific pollution control equipment/efficiency at the individual facility for the specific reporting year.

Georgia Case Study

1. Background Information

The State of Georgia facilities are required to report criteria air pollutants and ammonia emissions for the State emissions inventory (EI) on either an annual or triennial basis. Two main criteria determine the reporting applicability as well as the frequency: location in an attainment/nonattainment area and the facility potential to emit (PTE). The GA Environmental Protection Division (EPD) - Air Branch conducts an internal data QA check prior to the State submittal to the EPA National Emissions Inventory (NEI). The submittal criteria for the QA checks are currently being revised to include more stringent State requirements. The Hazardous Air Pollutant (HAPS) reporting for the EI is voluntary; therefore, the State will only submit HAP data to the NEI as reported in the State EI. Note that HAP emissions are reviewed in the facility air permit applications.

The annual Toxics Release Inventory (TRI) is directly submitted by the affected Georgia facilities to the EPA's TRI program. Historically, the GA EPD has not reviewed the TRI air emissions/release data, nor have they been compared to the EI emissions data.

2. Case Study Selection

Because there are limited emissions overlap with the TRI and the Georgia EI, GA EPD chose to compare the ammonia emissions submitted in the 2014 TRI and the NEI. The EPA Region IV had previously contacted two power plants in Georgia after comparing and finding discrepancies with the EI emissions and EPA's Clean Air Markets Division (CAMD) submittals, and those two facilities were also chosen for comparison with the TRI data. Additionally, two large paper mills were chosen due to their significant ammonia emissions.

3. Methods

Georgia compared the total, stack, and fugitive ammonia emissions for all four facilities for their 2014 data submittals. Discrepancies between the TRI and NEI data were noted, and each facility's environmental representative was contacted for further discussion. Each facility provided the background information regarding their individual submittals and the reasons for the discrepancies, with the exception of Paper Mill #2.

4. Findings

	Facility Type	Process(es)	Pollutant	TRI (TPY) Total, stack, fugitive	NEI (TPY) Total, stack, fugitive	Reason for difference	Resolution
GA	Power Plant #1 221112	Fossil fuel electric generation (coal)	Ammonia	37.5 0.3 37.5	37.8 37.8 0	A	Include fugitives in future NEI
GA	Power Plant #2 221112	Fossil fuel electric generation (coal)	Ammonia	7.1 0.1 7.1	7.1 7.1 0	A	Include fugitives in future NEI
GA	Paper Mill #1 322130	Kraft pulp and paper mill	Ammonia	90.2 89.7 0.5	90.2 52.1 38.1	B	Resubmittal of NEI data
GA	Paper Mill #2 322130	Kraft pulp and paper mill	Ammonia	95 95 0	96.3 36.5 59.8	C	Mill Investigating

A - For the power generation facilities, the total facility ammonia emissions for the NEI and TRI databases matched. However, the NEI emissions were all considered to be "stack" emissions, while the TRI emissions were split between stack emissions and fugitive emissions. The TRI fugitive emissions were less than 1 TPY. The facility contact noted that there was an oversight on their part regarding the Georgia EI requirement to submit the fugitive as well as stack ammonia emissions.

B - For paper mill #1, the total ammonia emissions for both the NEI and TRI databases were fairly similar. However, the split between the stack and fugitive emissions were not the same. The facility contact reviewed the data and determined there had been a reporting error for the NEI data. They have provided revised data that will be submitted to EPA.

C - For paper mill #2, the total ammonia emissions for both the NEI and TRI databases were fairly similar. However, the TRI submittal did not address fugitive emissions. The NEI split the stack emissions and fugitive emissions approximately 2/3. The facility was unsure of the discrepancies, and they are still investigating. It should be noted that this facility recently changed owners as well as environmental personnel.

Georgia utilized this information when providing the NEI training for the 2017 data submittal this year. It was emphasized to facilities that the fugitive data need to be included, and that the TRI and NEI data will be compared by GA EPD with discrepancies noted and requiring further follow-up.

Michigan Case Study

1. Background Information

Michigan facilities that are required to report criteria air pollutants (CAP) may also voluntarily report hazardous air pollutants (HAP) or air toxics. Per grant requirements with EPA, Michigan estimates HAPs in the Michigan Air Emissions Reporting System (MAERS) for those facilities required to report to the state's EI. The HAP estimates are based on throughput information, operating parameters and available emission factors (EFs). While some facilities choose to report HAP estimates, most facilities do not and rely on the HAPs estimated by the MAERS database. All facilities do have the opportunity to review these MAERS HAP estimates when they submit their reports each year. Historically, the QA / QC process for Michigan’s EI has not explicitly included review of a facility’s TRI submitted data.

2. Case Study Selection

Four facilities were selected for analysis. One facility was selected through a comparison (done by a CAER workgroup member) of the 2014 NEI to 2014 TRI by NAICS codes where a large reporting discrepancy was found for reported toluene from this facility. Two other facilities (paper mills) were selected because the SLT reported amounts of methanol greatly exceeded the amounts that these facilities reported to the TRI for this pollutant. The fourth facility was added when the MI Air Quality Division (AQD) was notified that the facility had been contacted regarding reported cyanide amounts (several tons) in the SLT inventory and non-reporting of cyanide to the TRI.

3. Methods

A similar set of methods was used to analyze the four case studies. This generally involved comparing the SLT reported emissions from a facility with those that the facility did (or did not) report to TRI. Next, it was then determined which dataset (TRI or SLT) was included for the NEI during the EI year (2014 or 2016) for the facility data in question. Additional steps included reviewing any documentation that the facilities had provided as part of their annual report submissions to MAERS. Lastly, some attempts to recreate facilities' reported pollutant amounts to TRI was done using the documentation (where available) provided as part of those facilities' MAERS reports. This was done to test the veracity of the TRI reported amounts in comparison to the facilities' estimates submitted to MAERS and subsequently the NEI.

4. Findings

	Facility Type	Process(es)	Pollutant	TRI (lbs.)	State or EPA Air Emissions Total (lbs.)	Reason for difference	Resolution
MI	Paper Bag and Coated and Treated Paper Manufacturing	Surface coating: 40200710, 40200712, and 40200922	Toluene	571,867	5670.64	A	B
MI	Paper mill	Sulfate (Kraft) pulping: 30700199 and 30700101	Methanol	104,000	2,599,500	C	D
MI	Paper mill	Sulfate (Kraft) pulping: 30700199 and 30700101	Methanol	350,632	1,146,100	C	D
MI	Fossil Fuel Electric Power Generation (EGU)	Industrial process – bituminous/subbituminous coal: 10200222	Cyanide	None reported by facility	18,473.31	E	F

A - Facility was first permitted in 1970s and obtained an ROP (Renewable Operating Permit i.e. Title V permit) in mid-1990s for ~400 tons permitted VOC. This period predated the State toxics screening that would later be required. Additionally, the ROP as described regulates the VOCs from the coating lines. The primary VOC in the coating is identified as being toluene, but the facility is only required to report this as VOC. Most of the VOC is reported under the listed SCCs, which only have VOC EFs in the MAERS database.

B - MIDEQ estimated toluene emissions based on the activities (SCCs) reported by the facility. This approach used EFs in MAERS, and those EFs were taken directly from WebFIRE. This method of estimation did not capture toluene from processes that were reported under SCCs that did not have an EF for toluene. For the TRI, toluene emissions were reported for the entire facility and hence included toluene from all processes there. Based on these discrepancies, a few possible solutions are possible. Toluene estimates could be manually added based on TRI reporting. Also, a toluene EF could be added to MAERS by looking at other SCCs and adapting those EFs. Additionally, it may be more appropriate for the facility to report toluene under a slightly different activity (SCC).
C - For the paper mills, the facility was repeatedly reporting the same activity (pulping) for the same material processed. As such, the available methanol EF was applied redundantly; consequently, the methanol emissions continued to be overestimated at the process (SCC) level. This resulted in inflated facility total methanol estimates for these paper mills in MIDEQ's inventory and thus the NEI.

D - For the 2017 inventory year, the facilities have selected more appropriate, stage-specific SCCs to describe the various processes that generate emissions; available emission factors will then be specific to those processes. Additionally, some site specific EFs will be added for at least one of the two paper mills based on documentation provided by the facility.

E - The cyanide EF in MAERS is from AP-42 and has a 'D' quality rating. Facility questioned the validity of this factor although it was based on testing done at 10 sites.

F - For the facility that did not report cyanide to the TRI, resolution has yet to occur. MI AQD is not compelling the facility to report cyanide to the TRI as the TRI program does not fall within our regulatory purview. MI AQD has expressed willingness to include site specific EFs or revised cyanide estimates in MAERS and to EPA's Emission Inventory System (EIS) should the facility choose to provide documentation to that effect.

South Carolina Case Study

1. Background Information

South Carolina collects emissions inventories from Title V (TV) sources based on either an annual frequency or a triennial frequency. TV sources with potential emissions (actual emissions for lead) equal to those listed in the AERR must submit annual emissions reports by March 31 following the reporting year. Every third year – regardless of potential emissions – all TV sources must submit an emissions inventory by March 31. For example, all TV facilities were required to submit an emissions inventory for 2017 by March 31, 2018.

These emissions inventories are an accounting of all emission processes at the facility including fugitives and non-permitted and insignificant activities. Facilities are required to submit emissions for all regulated pollutants, and these emissions include estimates for CAPs, HAPs, and State toxics. For mainly the fuel combustion processes, the Emissions Inventory Section has identified "expected pollutants," corresponding emissions factors based on AP-42 or WebFIRE, and standard units for process activity rates. Where needed, pollutants are added or deleted per these standard lists. Pollutants and emissions for other processes come from source tests, CEMs, material balance, or facility judgments (engineering judgments). After staff review and final review of staff changes by the regulated facility, the emissions are uploaded to EIS by the end of the year.

South Carolina currently does not review nor incorporate TRI estimates into its emissions inventory program. There is no mechanism in place for South Carolina to collect detailed emissions from conditional major or minor facilities. Since South Carolina only inventories the TV facilities, there are instances of TRI data from these smaller facilities being gap-filled into the NEI.

2. Case Study Selection

Two case studies were chosen, a steel mill and an electric generating station. In late February 2018, EPA Region 4 staff sent emails to facilities that had discrepant data in the 2014 NEI and 2014 TRI. The SC Emissions Inventory Section heard from several facilities about these calls. Some of these instances for discrepant data were the basis for these case studies.

3. Methods

For the generating station, the facility called to discuss its method for their 2017 emissions inventory estimates (because of the EPA R4 inquiry described above), and this discussion seemed to explain any historical differences in the TRI estimates and the State's emissions inventory estimates.

For the steel mill, the State reached out to the facility to discuss the different 2014 emissions inventory and TRI estimates. Through these discussions, the facility identified a reason for part of the difference, although the emissions inventory and TRI estimates are still not in complete agreement.

4. Findings

	Facility/Process	Pollutant	TRI Emissions 2014 (lbs.)	Emissions Inventory (lbs.)	Reason for Difference	Resolution
SC	**Generating Station**[1]	Ammonia	69,854	273,364	A	B
SC	**Steel Mill- Galvanizing Line**	Ammonia	0	19,421	C	D

1 This facility is an electric generating facility and operates three combustion turbines, burning natural gas and diesel. The facility also has a diesel emergency generator and diesel fire pump. SCCs of interest are: Natural Gas Combustion Turbine, SCC 20100201 and Diesel Combustion Turbine, SCC 20100101

A - The emissions inventory protocol uses factors based on WebFIRE. The facility bases its TRI calculations on guidance from the Electrical Power Research Institute (EPRI). This EPRI guidance takes into account calculations for aqueous ammonia which is used at the facility. It is unclear if the WebFIRE factors are for aqueous or anhydrous ammonia.

B - For the 2017 emissions inventory, SC has accepted the methodology used for TRI reporting for **this facility only** due to its use of aqueous ammonia. The emissions are currently coded as "engineering estimate" – SC may consider another method, such as "trade group" method. Because the 2017 TRI has not been submitted/ released, there is still potential for discrepant estimates between the two systems.

C - The facility has historically utilized testing information to report ammonia slip from its SNCR/SCR (this would also include combustion related ammonia) in its emissions inventory submittal. The facility realized that the ammonia emission factor for the preheat and radiant furnaces were higher than a "normal" natural gas emission factor. They believe the emissions inventory is double counting ammonia from this area, in both the combustion processes and the galvanizing process emissions.

D - For their 2017 emissions inventory submittal, the facility removed the ammonia emissions from the combustion processes (zeroed them out) and reported all ammonia under the galvanizing line process. While this should decrease facility-wide ammonia emissions by around 6000 lbs., it still does not fully rectify ammonia differences in the emissions inventory and TRI. Because the 2017 TRI has not been submitted/ released, there is still potential for discrepant estimates between the two systems.

Texas

1. Background Information - Short description of the EI program and its relationship with TRI

The Texas Commission on Environmental Quality's (TCEQ) air emissions inventory (EI) supports state as well as federal requirements for state implementation planning inventories, modeling, monitoring site assessments, applicable requirements under the Title V program, air quality planning and investigations, prevention of significant deterioration and nonattainment New Source Review netting, other aspects of air permitting, air quality planning, and cap and trade programs. Currently, the TCEQ accomplishes data collection for the above programs through its air EI, which also gathers the required information for National Emissions Inventory (NEI) reporting.

<u>Point Source EI Details</u>

The TCEQ collects point source emissions inventories data annually for regulated entities (sites) that met the reporting requirements of 30 Texas Administrative Code (TAC) Rule (§) 101.10. If the site meets the reporting requirements of 30 TAC § 101.10 or if the TCEQ sends a notification that an EI is required, then an EI must be submitted. In general, major stationary sources of air emissions are required to submit emissions inventories.

Approximately 2,100 sites report emissions data from approximately 100,000 sources to the TCEQ annually. In accordance with 30 TAC § 101.10, the emissions inventories for the current reporting year must be submitted by March 31 (approximately 98% of the sites) or 90 days from the date of the TCEQ's request to submit an EI, whichever is later.

All sites that meet the reporting requirements of 30 TAC § 101.10 are required to submit their EI using a Web-based system. The Web-based system includes data validation routines to improve the quality of the data received and immediate feedback is provided to the user as the data are entered. The TCEQ updates approximately one million emission records annually using this electronic reporting system.

After submitting, the EI is routed to a TCEQ EI Specialist who quality assures the emissions and related data. Regulated entities are provided with an annually updated, 200-page Emissions Inventory Guidelines document outlining the reporting requirements, type of data to provide and Technical Supplements providing information on common emissions source types and calculations. Sites are required to report emission sources and their associated emissions, emissions determination methodologies, coordinate data and various characteristics about the sources. All pollutants are required to be reported, i.e.; any volatile organic compound (VOC), any pollutant required to submit to the federal Clean Air Act Section 111 or listed as a hazardous air pollutant (HAP) under Section 112, each pollutant that has a national primary ambient air quality standard, or any other air pollutant subject to the requirements under TCEQ rules, regulations, permits, orders of the commission or court

orders. Per 30 TAC § 101.10, continuous emissions monitoring (CEMS) data is the preferred method to determine emissions. In the absence of CEMS, a general order of preference list is provided in the *2017 Emissions Inventory Guidelines,* Chapter 4:
https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg360/rg360-17/Chapter4.pdf. EI Specialists review sample calculations and supporting documentation that are required to be submitted with EI to ensure that the most appropriate emissions determination method based on the source type and pollutant was used, review coordinate data, verify source characteristic data and cross-reference emissions data with other databases. During the quality assurance process, the EI Specialists may contact the sites regarding discrepancies, unclear information or missing data and will formally request revisions to the EI when appropriate.

One part of the quality assurance review performed by the EI Specialists is a comparison of the total air toxics emissions from sites that are required to report to both the federal Toxic Release Inventory (TRI) and to the EI. The Texas TRI Coordinator reviews and compares toxics emissions data in the TRI to the point source EI and focuses the EI Specialist review on contaminants of interest. Sites are questioned about the potential discrepancies for the contaminants of interest that are above a certain tonnage or percent difference. Sites are asked to provide an explanation and revise the EI, if the best available method as defined by the current Emissions Inventory Guidelines was not used to determine the emissions. Additionally, sites are directed to submit revised TRI data to the EPA when appropriate. Because the timelines for reporting to the TCEQ point source EI and the TRI are different, staggering the TRI and EI comparison is necessary to allow sufficient time for a quality review of the data sets. The preliminary TRI data is released in July by the EPA and finalized in October, while the emissions inventories are due March 31. The sites with the emissions discrepancies of most concern are reviewed by November 1 and the remaining discrepancies are reviewed by March 1 of the following year. For example, when comparing the 2016 reporting year discrepancies, the discrepancies of the highest concern were reviewed by November 1, 2017 and the remaining were reviewed by March 1, 2018.

After the EI Specialists have quality assured the data and an additional global review of emissions and characteristic data has been conducted to further identify suspicious or incorrect data and identify trends, the point source EI is uploaded to the EIS by December 31. Revisions to the TCEQ point source EI are submitted after December 31 to the EIS as needed.

2. Case Study Selection

The following case study sites were chosen because they represent a few of the most common emissions discrepancies scenarios. For the 2016 reporting year, the TCEQ had already reviewed discrepancies between the EI and the TRI as part of the annual quality assurance process performed by the TCEQ EI Specialists.

- Discrepancy resolved, EI emissions revised
- Discrepancy resolved, TRI emissions revised
- Discrepancy, no action required
    - EI emissions reported as unclassified contaminants because they did not meet the EI requirements to be speciated
    - Different determination methodologies required for the programs
    - TRI may include emissions totals from multiple EI sites
    - Sources(s) below EI reporting thresholds
    - Other scenarios that don't fall under a category listed above

3. Methods

As part of the annual, routine 2016 quality assurance review, the TCEQ EI Specialists contacted sites about discrepancies between TRI and EI reported emissions. Most of the sites were contacted between August 2017 and March 2018. The discrepancy, explanation and resolution were documented as part of the annual quality assurance review.

4. Findings

	Industry Type	Pollutant	*2016 TRI Air Emissions Total in tpy *As of 8/1/17	*2016 TCEQ point source EI Air Emissions Total in tpy *As of 8/1/17	Reason for Difference	Resolution
TX	2911-Petroleum Refining	Methanol	45.794	1.794	A	A
TX	3251-Brick and Structural Clay Tile	Hydrochloric Acid (1995 and after "Acid Aerosols" only)	51.251	8.12	B	B
TX	2911-Petroleum Refining	N-Hexane	99	58.7139	C	C
TX	2822-Synthetic Rubber	Cyclohexane	12.2245	9.8193	D	D
TX	4911-Electric Services	Lead Compounds	0.0746	0.0733	E	E

1.

A - 2016 methanol emissions discrepancy from a refinery was resolved by the site revising the EI to match the TRI. Mistake in the EI reporting was corrected.

B - 2016 hydrochloric acid emissions discrepancy from a brick facility was resolved by the site revising the TRI to match the EI. Mistake in the TRI reporting was corrected.

C - 2016 n-hexane emissions discrepancy from a refinery did not result in revised TRI or EI emissions. One reason for the discrepancy was that hexane emissions from the natural gas fired external combustion sources were not reported in the EI because the best available method was AP-42 Section 1.4 emission factors. For EI purposes, if an AP-42 emission factor is rated below “C”, it is not required to be used to speciate emissions. For TRI, the site used the AP-42 Section 1.4 hexane emission factor of 1.8 lb/MMscf that is rated “E” for the natural gas fired external combustion sources.

D - 2016 cyclohexane emission discrepancy from a rubber manufacturing plant was resolved by the company providing further speciation in the EI to more closely match the TRI. Initially, in the EI, the cyclohexane was grouped and reported under the VOC-unclassified contaminant code rather than being reported under the specific cyclohexane contaminant code.
Note—there are scenarios where the site is not required to further speciate in the EI which can cause a discrepancy between the TRI and the EI. A summary of EI speciation requirements can be found in the *2017 Emissions Inventory Guidelines*, Chapter 4, “Table 4-3. Summary of Speciation Criteria”: https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg360/rg360-17/Chapter4.pdf.

E - 2016 lead compounds emissions discrepancy from a coal-fired electric generating facility did not result in revised TRI or EI emissions. The TRI includes multiple lead fugitive emissions from welding sources that do not meet the requirements to be included in the EI.
Note—Requirements to add an emissions source to the EI can be found in the *2017 Emissions Inventory Guidelines,* Chapter 3: https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg360/rg360-17/Chapter3.pdf

Minnesota Case Study

1. Background Information

Minnesota, like many other states, has a rule mandating CAP emission reporting, but does not have a rule mandating emission reporting for air toxics (AT). The Minnesota emission inventory rule requires all facilities in Minnesota that have an air emissions permit to submit an annual emissions inventory report of criteria pollutants to the Minnesota Pollution Control Agency (MPCA). Therefore, the CAP EI is updated annually. It is not only used to track the actual pollutant emissions of each facility, but the CAP EI is also used to calculate an annual emission fee for each facility. In contrast, the AT EI is updated triennially. The AT EI for point sources relies on voluntary data reporting from facilities, emission factor calculations, and data from the TRI.

In Minnesota, TRI data are handled by the Department of Public Safety. The MPCA obtain TRI data from the Department of Public Safety after state QA/QC and EPA public release late in the year after the TRI reporting year or early in the year two years after that reporting year. MPCA reviews and compares TRI data with the AT EI data reported by facilities or estimated by the MPCA. For emissions from the TRI only facilities, MPCA takes them to fill up the AT EI. For emission sources that exist in both TRI and AT EI, MPCA does further investigations and contacts facilities if necessary. Due to differing levels of details in the emission data between TRI and the AT EI, most of this work is manual and takes a long time.

Since there is a short timeframe between obtaining TRI data and the deadline for NEI submittal, MPCA usually continues the TRI review after the submission of data to the NEI version 1.

2. Case Study Selection

Minnesota used TRI data in the compilation of the state AT EI, therefore, the case studies were conducted for many sources that were in both TRI and the AT EI and had significant differences in emissions. The level of significance was determined based on a pollutant's health impact and staff’s experience. When investigating emissions for pollutants with significant differences for a source, MPCA might also review differences for other pollutants at the same time if possible.

A summary of 40 case studies are included in this report.

3. Methods

For the selected cases, first, emissions in the AT EI were reviewed to determine if the TRI emissions were reported to the processes that potentially emit the pollutants. For the emissions reported to the AT EI, proper use of control efficiencies was ensured. Emissions in the AT EI with process-specific emission information, such as stack testing, would be considered at a high quality. If emissions did not report to the AT EI proper processes but obviously should be emitted, TRI emissions would be considered. For example, styrene should be emitted from processing fiberglass resin products, the TRI emissions would be directly used in the AT EI.

Second, we provided emission differences between the AT EI and TRI to facilities to learn the reasons for emission differences if the reasons were not obvious. E-mail would initiate the discussion followed by phone calls and more e-mails. Generally, facilities responded very well. However, it could take a long time, particularly when facilities had staff turnovers or owner changes. We also provided explanation of rules, technical assistances, and/or guidance to facilities in follow-ups.

As a result, the case study improved the emissions in the 2014 AT EI and facilities will carry the findings to the future AT EIs and TRI reports.

4. Findings – see Annex 1

ANNEX 1: Minnesota – Table with Case Study Findings

* Case study was conducted for the 2014 MN air toxics emission inventory AT EI and the 2014 TRI.
* All emissions are in LBS.

Facility	Process	Chemical	TRI Total	MN AT EI Total	Resolution for AT EI	Reason
Steel Foundries	Secondary Metals /Steel Foundries	Copper	264	0.01	Added TRI emissions	Misunderstood the online reporting function for EI
Fabricated Metal Product Manufacturing	Degreaser	Trichloroethylene	14,569	0	Added TRI emissions	Contacted facility many times. The process has been there with VOC emissions correlated to trichloroethylene emissions and the facility has reported trichloroethylene emissions to TRI up to now. Therefore, taking TRI data as is.
Steel Investment Foundries	Secondary Metals /Steel Foundries	Chromium	55	0	Cr III: 53.31	It was the first year for the facility to report to TRI.
					Cr VI: 1.649	
		Nickel	0	0	Added 28.17	Although the facility did not need to report to TRI, nickel was calculated at the same time as calculating for chromium.
Reconstituted Wood Product Manufacturing	Wood and natural gas combustion	Hydrochloric Acid	0	18,342.0	Changed to 448	Original generic emission factors were used in AT EI calculation. TRI used site-specific emission factors. Emissions were lower than threshold, 25,000 lbs., so it was not subject to TRI report. Facility did not pay attention to the differences between AT EI and TRI. After discussion, facility provided site-specific emission factors to the AT EI.
		Ammonia	0	34,444.0	Changed to 5273.6	
Iron Foundries	Electric Induction Furnace	Copper	216	0.02	No change	AT EI used industry specific emission factors approved for use by the MPCA and the appropriate controls. TRI report used generic PM emission factors and assumed an even release ratio for constituents of each metal and did not account for all the operated control units. They will correct TRI in the future.
		Manganese	1,116	2.9		
Fats and Oils Refining and Blending	Vegetable Oil Processing /Oil Extraction	n-Hexane	413,251	824.52	Changed to 413,251	TRI calculation of the air emissions was also considering the n-Hexane in meal, recycled, and water. Therefore, using TRI value for grain processes was the resolution.
Motor Vehicle Body Manufacturing	Welding Operations, Wet Plasma Torch Cutting, Bead Blasting & Plasma Cutting	Chromium	88	15.24	Added Cr.III: 70.58	The emission differences were due to the consideration of insignificant activities in TRI. Permit did not include insignificant activities, so emissions were excluded from the CAP EI. AT EI did not have that restriction.
					Cr. VI: 2.183	
		Copper	23	0.02	Added 23	
		Manganese	109	0.18	Added 108	
		Nickel	111	6.64	Added 104.4	
Paper Mills	Paper Mills	Acetaldehyde	28,100	8,619.49	No change	In general, the facility tended to report TRI emissions conservatively because these emissions were charged for the Minnesota Pollution Prevention Act. Many TRI EFs are not site-specific factors and are not even point source factors but rather area source factors from historical trade group publications. In contrast, the AT EI emissions are specific to emission units and point sources found in the Title V
		Ammonia	166,500	45,752.00		
		Methanol	127,000	94,082.20		

		Phenol	380	9.03		permit. In fact, one may find all these EFs included in PTE calculations which are used for Title V permit applications.
		Zinc	343	25.64		
Other Animal Food Manufacturing	Mineral Products	Ammonia	6,894	1.65	Added 6894.58	TRI emissions were accurate.
		Cobalt Compounds	40	0	Added TRI emissions	
Petroleum Refinery	Process Heater/Process Gas Fired	Hydrogen cyanide	67,475	0	No change	TRI and AT EI were reported in different pollutant codes.
		Cyanide	0	67,475.00		
Aluminum Production and Processing	Aluminum Extrusion along with Cutting Sawing	Chromium	58	165.4	Revised to 49.6	Many different alloys were used. Only one alloy exceeded the TRI de minimis level, so, the facility only reported emissions for that alloy to TRI. The facility used the average metal % for all alloys in the permit to calculate emissions for AT EI. Revised numbers were more in-line with the 2014 TRI report; however, they did not account for de minimis thresholds.
		Manganese	43	1,655	Revised to 66.2	
Ethanol Manufacturing	Ethanol Processes	Acetaldehyde	7,232	99.63	Changed to 476.8	TRI used the suggested EPA emission factors which did not consider controls for natural gas combustion. AT EI used stack testing data. However, originally reported data for AT EI had errors in throughputs and controls. The corrected vales were more representative.
		Formaldehyde	1,549	83.74	Changed to 167.184	
		Methanol	1,495	48.63	Changed to 1558.45	
Mineral Wool Manufacturing	In-Process Fuel Use /Coke	Carbonyl sulfide	2,948	267.1	No change	AT EI is correct. The TRI is higher due to an error in calculation.
Semiconductor Manufacturing	Etching and MISC Operations	Hydrogen fluoride	64	8,800	Using TRI value, 64	Facility used control for TRI, not for AT EI because the controls are not certified in permit. MN rule does not allow facilities to take credits for CAP emissions if the control measure is not certified.
Paint and Coating Manufacturing	Varnish Manufacturing	1,2,4-Trimethylbenzene	5,413	2	Changed it to 5,413	TRI emissions are correct.
Paint and Coating Manufacturing	Storage Tanks	Xylene (mixed isomers)	1,500	0	Changed to 480	Facility originally did not report to the AT EI, but reported to the TRI in a range of 500 - 999 for both stack and fugitive. After contacted, the facility provided 480 lbs. of Xylene emissions with a detailed calculation.
		p-Xylene	0	8.3	No change	
Miscellaneous General Purpose Machinery Manufacturing	Spray Booth/ Coating Line	N,N-Dimethylformamide	13,541	316	Used 13,541	TRI emissions are correct. Facility only reported emissions from a stack test and did not report fugitive emissions to the AT EI.
Plastics Product Manufacturing	Fiberglass Resin Products	Styrene	20,498	0	Added TRI emissions	The facility reported 12.69 ton of VOC emissions, but not HAP emissions. Styrene should also be emitted.
Travel Trailer and Camper Manufacturing	Fiberglass Resin Products	Methyl methacrylate	3,319	2	Changed to 3,340	Facility added the methyl methacrylate to the styrene estimate in order to show compliance with the MACT standard. The emissions were reported to the AT EI after contacted.
		Styrene	25,297	28,806	Changed to 25,506	
Ethanol Manufacturing	Ethanol Processes	Acetaldehyde	6,438	250	7,724	Emissions in AT EI were incorrect because control efficiencies were used on stack testing results.
		Acrolein	1,818	30	3,426	
		Benzene	133	62	71	
		Formaldehyde	542	3	325	

		n-Hexane	6,640	393	8,070	
		Methanol	777	38	831	
		Toluene	36	38	53	
Animal (except Poultry) Slaughtering	Deep Fat Frying	Ammonia	15,377	2,422.32	Added 15,377	The emission reported to the AT EI were from combustion. Ammonia was also emitted from other processes.
Metal Container Manufacturing	Spray Coating	Toluene	6,697	8,973	No change for the 2014 AT EI, but will be for the 2017 AT EI	Facility changed staff, and it took a long time to get a response. The AT EI uses the worst-case scenario (highest % in a range given on a material data safety sheet (MSDS) to calculate solvents released during liquid coating operations). The TRI uses averages from the ranges given on an MSDS, as well as excluding anything that falls below the de minimis when calculating the average. Facility thought both methods followed the regulatory guidance for calculating the AT EI and TRI totals. However, the guidance is for permitting and compliance not for AT EI. We need to have a clear guidance for AT EI reporting.
		Xylene (mixed isomers)	5,435	10,252		
Plastics Product Manufacturing	Fiberglass Resin Products	Styrene	4,449	0	Added the TRI emissions	Styrene should be emitted. Facility reported emissions for the 2017 EI.
Metal Can Manufacturing	Print-Publish /General /Printing: Flexographic	Glycol Ethers	204,052	7,784	Added 198,900 lbs. of Butyl Cellosolve emissions	The unreported glycol ether was Butyl Cellosolve, Cas # 111-76-2, which was removed from the HAP list of glycol ethers after the 2005 NEI, but still under the definition of TRI glycol ethers. The emissions were originally added to the AT EI because MPCA could not contact the facility due to the owner change at the facility. New owner answered the question. The additional emissions for Butyl Cellosolve were added to the AT EI.
Paperboard Mills	Ext Comb /Industrial /Natural Gas	Mercury	1	0.03	No change	The difference is a result of the different mercury emission factors. The mercury emissions are calculated based on an emission factor from AP-42 in the TRI and the EPRI emission factor provided by the MPCA in the AT EI.
Dog and Cat Food Manufacturing	Waste Water Treatment	Ammonia	344,707	8,771	Added 335,936	The emissions were from the wastewater pond that is not included in permit. Added emissions to EU0000.
Ethanol Manufacturing	Ethanol Processes	Acetaldehyde	20,692	1,645		The company only operated 4 -6 weeks in 2014. The TRI number was incorrect. The facility was shut down in the end of 2015 and in construction now. The values reported to MPCA were correct.
		Ammonia	302	226	No change	
		Formaldehyde	1,272	195		
Metal Can Manufacturing	Three Piece Can Sheet Lithographic Coating Oven	Glycol Ethers	10,273	294	No change	Facility used the same capture and control efficiency number for all plants owned by the parent company in order to remain consistent for all US plants for TRI. For the AT EI report, the actual capture and control efficiency is used as per testing conducted at the plant.
		Xylene (mixed isomers)	9,482	1,832		
		1,2,4-Trimethylbenzene	7,858	0	Added 432	It is not a HAP but it is collected by MPCA. The facility did not track it discretely in emission reporting equations; rather it was aggregated into the VOC numbers. Facility provided the estimates.
All Other Transportation Equipment Manufacturing	Surface Coating /Thinning	Glycol Ethers	13,222	0	Added TRI emissions for Butyl Cellosolve	The emissions were for Butyl Cellosolve, CAS # is 111-76-2. It was only delisted as a HAP in 2004, but it is still reportable under TRI.

	Solvents - E-coat					
Clay Building Material and Refractories Manufacturing	Electric Arc Furnace North	Chromium Compounds	17	Cr. VI : 0.00831 Cr. III: 0.1994	Added Cr. VI : 1.468 Cr. III: 7.535	Emission factors from stack testing were available, however, throughput data were missing in the AT EI.
		Manganese Compounds	100	0.056392	Added 95.88	
		Nickel Compounds	13	0.31164	Added 13.22	
Metal Can Manufacturing	Metal Can Coating	Glycol Ethers	1,183	0	Added 23	The glycol ether group reported for the TRI includes mostly butyl cellosolve that is not a HAP and would still need to be reported on the AT EI. However, 23 lbs. of the glycol ethers were HAPs.
		1,2,4-Trimethylbenzene	371	0	Added 371	It Is not a HAP, but it is included in the AT list for MPCA's emission inventory. The facility did not realize this.
Plate Work Manufacturing	Grinding, Welding, and Blasting,	Chromium	37	0	Added Cr III 21.82, Cr VI 0.0675	TRI used conservative estimates. Emissions were from insignificant activities. Detailed calculations were provided.
		Manganese	37	0	Added 2.44	
		Nickel	100	0	Added 10.83	
Asphalt Shingle and Coating Materials Manufacturing	Miscellaneous Industrial Processes	Toluene	799	0.03509	Added 798.95	Facility changed owner in 2016. New owner cannot validate the 2014 emissions.
Wood Kitchen Cabinet and Countertop Manufacturing	Surface Coating	Toluene	3,072	3.373236	Added 3,072	The numbers reported on the TRI were using "material balance" engineering calculations based on actual coatings used and chemical constituents in the outgoing waste shipments. Facility relied on MPCA to do calculations for the AT EI. However, the emission factors are not available to do this.
		Xylene (mixed isomers)	7,377	0	Added 7,377	
Fossil Fuel Electric Power Generation	Ammonia tanks and boiler water treatment	Ammonia	13,526	5,308	Added 13,526	Ammonia tanks and boiler water treatment are not reported through AT EI or included in the permit.
	Ext Comb /Electric Gen /Subbituminous Coal /Pulverized Coal: Dry Bottom	Hydrogen fluoride	12,200	46,946	Changed to 18,648	TRI used the 2014 facility-specific concentration provided in the EPRI formula. The AT EI used the previous year's concentration.
		Manganese Compounds	638	1,958	No Change - data not provided	
		Nickel Compounds	190	478	No Change - data not provided	
		Naphthalene	31	86	Corrected to 27	AT EI used emission factors from the 2002 EPRI. TRI used emission factor from 2014 EPRI data that is about ½ the value in the 2002 EPRI.
Ethanol Manufacturing	Ethanol Processing	Acetaldehyde	13,051	9,158	Changed to12,794	Control efficiencies were used for stack testing emission factors in AT EI. It caused emissions in the AT EI to be less than TRI.
		Acrolein	9,146	3,380	Changed to 9,134	

		Ammonia	9,392	0	Changed to 9,397	
		Formaldehyde	2,257	978	Changed to 2,248	
		Methanol	3,622	1,367	Changed to 3,621	
		Chlorine	22,800		Changed to 29	TRI emissions were overestimated. The chlorine gas dissociates in the water. There is only a small amount of chlorine emissions due to leaks.
		n-Hexane	6,817	4,598	Changed to 6,476 Also corrected TRI emissions	The facility re-calculated n-hexane based on the amount of natural gas combusted and the content of n-hexane in the facility's ethanol denaturant that year, using a newer software to calculate emissions from storage tanks. The TRI reports allow rounding of emissions to two significant figures, so n-Hexane was reported as 6,500 lbs. on the revised 2014 TRI. On the AT EI, n-hexane should have been reported as 6,476 lbs. that year.
Truck Trailer Manufacturing	Metal fabrication, plasma cutting, welding, grinding	Chromium	6,752	0.0053804	No change	Metal emissions were from processes not included in permitting, such as grinding, plasma cutting, and welding. The emissions were calculated for PTE. The facility used enclosure from 2017. Facility will share the 2017 TRI emissions with MPCA.
		Cobalt	143	0		
		Copper	1,351	0.002934		
		Lead	67	0		
		Manganese	2,708	0.3864		
		Nickel	6,511	0.0014672		
Petroleum Refineries		Hydrogen cyanide	59,000	6413.84	EF changes after 2014 AT EI reporting. Updated AT EI with the new EF, 58,308 lbs.	The large HCN emissions change from the AT EI to the TRI is based on the updated EPA FCC HCN emission factor (from 770 lb/MMbbl to 7,000 lb/MMbbl) published in EPA's (late) April 2015 Emission Estimation Protocol for Petroleum Refineries. The TRI-reported emissions are more representative.
	Insignificant activities not included in permitting, such as from various paints, lubricants, and aerosols	Tetrachloroethylen e	1,201	788.70461	Added 412	The TRI-reported emissions included those from various paints, lubricants, and aerosols at the facility. The associated emissions were not included in the AT EI because the emissions sources are insignificant activities and are not included in the permit.
		Xylene (mixed isomers)	10,800	7693.1628	Added 3106	
Fossil Fuel Electric Power Generation	Ammonia tanks and boiler water treatment	Ammonia	31,100	0	No Change - data not provided	Ammonia tanks and boiler water treatment are not reported through AT EI or included in the permit.
	Ext Comb /Electric Gen /Subbituminou s Coal /Cyclone Furnace	Hydrogen fluoride	1,770	5784		TRI used the 2014 facility-specific concentration included in the EPRI formula. The AT EI used the previous year's concentration.
		Manganese Compounds	55	148.35331		
		Mercury Compounds	13	17.800848		

APPENDIX D: Cross walks of NEI and TRI emission estimation codes

Cross walks of NEI and TRI emission estimation codes

Executive Summary

The purpose of this deliverable is to provide a mapping NEI and TRI estimation codes that could be used for the common form to allow data to be shared. Emission estimation codes are used in state, NEI and TRI data collection systems as a meta data field. One of their purposes is to get some sense of the quality of the emissions estimate.

The NEI codes, which are called "emission calculation method" codes are much more numerous and detailed than the TRI codes, which are called "basis of estimate" codes. Many codes are not easily mapped 1-to-1 so a "best fit" was developed. In addition, it was discovered that some of the codes were not clear, and the team had different interpretations of the codes and inherent quality. The team developed a set of findings and recommendations to be considered for the common form.
Table 1 provides a mapping between TRI Basis-of-Estimate Codes and NEI Emission Calculation Method Codes, and Table 2 provides a mapping between NEI Emission Calculation Method Codes and TRI Basis-of-Estimate Codes.

A possible follow up is to develop a new set of codes and guidance on how each code should be used.

Findings

1. Team members had different interpretations of some of the codes, when they should be used and the presumption of quality. For example:
   - If the emission calculations were based on a test was done in a different year than the inventory year - some thought the code could be source test, others thought it would be "other" (or engineering judgement). In some states, test data should not be used to estimate emissions if the test data are more than 5 years old (for some pollutants).
   - If a test was done on a similar unit at a sister plant at the within the state, it could be a source test, but if it was done on a sister plant in a different state it would be "Other emission factor" (because the state would not have reviewed the test plan). Others thought that a test at a sister unit could be "site specific emission factor".
   - Some view "Site specific" as a level of the factor which would be used for the entire facility when you do not have process-specific information.
   - Some put "Engineering judgement" ahead of trade group emission factor with respect to data quality, others view it as the lowest level of data quality.
2. NEI codes "Manufacturer Specification" and "Vendor Emission Factor" appear to overlap.
3. States use their own codes which may be different than the ones used Tables 1 and 2. The following codes are not used by TRI or NEI are used by states on this team

State	Code
Michigan	PEM (Parametric Emissions Monitoring) Facility EF (Could come from a variety of sources but is specific to that facility) Tank Model Landfill Model (LandGEM Model)

	MAERS EmissionFactor (Emission factors in the Michigan Air Emissions Reporting System (MAERS) database. Most from Webfire, some state specific and miscellaneous also.) Other (Anything else not covered above, including best guess or estimation scenarios)
Minnesota	PERMIT LIMIT (Permit Limit) Process-Specific Factor Specified applicable levels for emission factors (See MN_emission_calculation_codes and levels.xlsx) Prefer to have specifications of control and uncontrol for speciation factors. For example, in EPA NEI augmentation for PM-CON, uncontrolled ratios of PM-CON/PM10-FIL are used for controlled processes. This implies PM-CON controlled the same as PM10-FIL. However, many PM control devices may only control PM-FIL species, not PM-CON.

Recommendations

1. Additional guidance and examples needs to be provided on the codes in both NEI and TRI programs. Explanations are particularly needed for
    - When would "emissions test" be used- there needs to be guidance on whether the particular unit being estimated has been tested (or a unit at a sister plant within the state) and whether the date of the test would influence whether this code can be used.
    - What is considered "published" (E1-Published Emission Factor)
    - What is considered site specific (TRI code = E2 ; EIS code = 10 or 30)
2. If there is an "Other" on the common form, then have a text box to for facility to explain
3. Common form should provide guidance such as a "code finder" based on set of questions/key words.
4. Enable the ability to pass through raw data of what was submitted (if it eventually gets mapped to different value in TRI or NEI).
5. Find out from other states if we are we missing codes that SLTs use that we need to add to the form to make it useful in all states. Maybe survey states to get additional codes they are using and if consolidation to fewer codes (i.e., proposal in item 6) would be acceptable or would deter them from using the common form.
6. Consider new set of fewer codes for common form.
    - Current codes that are good/useful and should be kept: continuous emission monitoring (EIS code of 1, TRI code of M1) and material or mass balance (EIS code of 3, TRI code =C)
    - Collapse some of the emission factor options for the common form. Determine if there needs to be a distinction between literature, trade association, vendor/manufacturer, and other emission factor codes in the NEI. Decide whether there needs to be a distinction for control efficiency.
    - Provide "Other published emission factor" – as an option (which would be mapped to E1-Other Published). Provide field to explain where it came from.
    - Provide "Other emission factor" as an option (which would be mapped to TRI code "O- Other"). Provide field to explain where it came from.

Table 1: Mapping of TRI basis of estimate codes to EIS Emission Calculation Method Codes

TRI Basis of Estimate Code	NEI Emission Calculation Method Code	Comments	Best fit
M1 - Continuous Monitoring Data/ Measurements	1 - Continuous Emission Monitoring System		1
M2 - Periodic or Random Monitoring Data/ Measurements	4 Stack Test (no Control Efficiency used) 24 Stack Test (pre-control) plus Control Efficiency	Need guidance on when to use this code with respect to date of stack test and whether/when a stack test at a "sister" facility counts.	4
E1- Published Emissions Factors	7 Manufacturer Specification 8 USEPA Emission Factor (no Control Efficiency used) 9 S/L/T Emission Factor (no Control Efficiency used) 11 Vendor Emission Factor (no Control Efficiency used) 12 Trade Group Emission Factor (no Control Efficiency used) 13 Other Emission Factor (no Control Efficiency used) 28 USEPA Emission Factor (pre-control) plus Control Efficiency 29 S/L/T Emission Factor (pre-control) plus Control Efficiency 31 Vendor Emission Factor (pre-control) plus Control Efficiency 32 Trade Group Emission Factor (pre-control) plus Control Efficiency 33 Other Emission Factor (pre-control) plus Control Efficiency 40 Emission Factor based on Regional Testing Program 41 Emission Factor based on data available peer reviewed literature 5 USEPA Speciation Profile 6 S/L/T Speciation Profile	"Published emission factor" can be from any source, including vendor, trade group, regional testing program. Other does not fit "published", but "published" can be "other". The other NEI EF-related codes do not fit E1. As a result, we have mapped TRI code E1 to NEI code 13. We cannot map EIS code 13 to E1.	13
E2- Site-specific Emissions Factors (i.e., considers actual site conditions)	10 Site-Specific Emission Factor (no Control Efficiency used) 30 Site-Specific Emission Factor (pre-control) plus Control Efficiency		10
C – mass balance calculations	3 Material balance		3
O - Other (e.g., engineering calculations; best engineering judgment)	2 Engineering Judgement		2

Table 2: Mapping of EIS Emission Calculation Method Codes to TRI basis of estimate codes

EIS Emission Calculation Method Code	TRI Basis of Estimate Code	Comments	Best fit
1 - Continuous Emission Monitoring System	**M1 -** Continuous Monitoring Data/ Measurements		M1
4 - Stack Test (no Control Efficiency used)	**M2** - Periodic or Random Monitoring Data/ Measurements	Use for[1]: • Facility/process-specific emission factor. Average of representative stack tests (on one stack) downstream of controls (or if no controls). • Single representative facility/process-specific stack test downstream of controls (or if no controls).	M2
24 - Stack Test (pre-control) plus Control Efficiency	**M2** - Periodic or Random Monitoring Data/ Measurements	Use for[1]: • Facility/process-specific uncontrolled emission factor, plus control efficiency. Average of representative stack tests (on one stack) upstream of controls, adjusted based on expected control efficiency. • Single representative facility/process-specific stack test upstream of controls (or if no controls), adjusted based on expected control efficiency.	M2
10 - Site-Specific Emission Factor (no Control Efficiency used)	**E2**- Site-specific Emissions Factors (i.e., considers actual site conditions)	Average of representative stack tests across multiple stacks or processes, downstream of controls (or if no controls). [1] The 2017 NEI plan[2] indicates this or code 9 be used for the EFs from the Mercury and Air Toxics Test Program which are unit, facility or average emission factors based on unit/fuel/controls used.	E2
30 - Site-Specific Emission Factor (pre-control) plus Control Efficiency	**E2**- Site-specific Emissions Factors (i.e., considers actual site conditions)	Average of representative stack tests across multiple stacks or processes, upstream of controls, adjusted based on expected control efficiency. Only makes sense when all processes measured are fed to the same type/combination of control devices. [1]	E2
3 - Material Balance	**C** -Mass balance calculations		C
7 - Manufacturer Specification	**E1**- Published Emissions Factors		E1
8 - USEPA Emission Factor (no Control Efficiency used)	**E1**- Published Emissions Factors		E1
9- S/L/T Emission Factor (no Control Efficiency used)	**E1**- Published Emissions Factors		E1

EIS Emission Calculation Method Code	TRI Basis of Estimate Code	Comments	Best fit
11- Vendor Emission Factor (no Control Efficiency used)	**E1**- Published Emissions Factors		E1
12 - Trade Group Emission Factor (no Control Efficiency used)	**E1**- Published Emissions Factors		E1
13 - Other Emission Factor (no Control Efficiency used)	**O** - Other (e.g., engineering calculations; best engineering judgment)		O
28 - USEPA Emission Factor (pre-control) plus Control Efficiency	**E1**- Published Emissions Factors		E1
29 - S/L/T Emission Factor (pre-control) plus Control Efficiency	**E1**- Published Emissions Factors		E1
31 - Vendor Emission Factor (pre-control) plus Control Efficiency	**E1**- Published Emissions Factors		E1
32 - Trade Group Emission Factor (pre-control) plus Control Efficiency	**E1**- Published Emissions Factors		E1
33- Other Emission Factor (pre-control) plus Control Efficiency	**O** - Other (e.g., engineering calculations; best engineering judgment)		O
40 - Emission Factor based on Regional Testing Program	**E1**- Published Emissions Factors		E1
41- Emission Factor based on data available peer reviewed literature	**E1**- Published Emissions Factors		E1
42 - Emission Factor based on Fire Emission Production Simulator (FEPS)		Not applicable to TRI- this is for emissions from wildfires or prescribed burning	
5 - USEPA Speciation Profile	**E1**- Published Emissions Factors		E1
6 - S/L/T Speciation Profile	**E1**- Published Emissions Factors		E1
2 - Engineering Judgment	**O** - Other (e.g., engineering calculations; best engineering judgment)		O

[1] Reference: Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, EPA-454/B-17-003, July 2017.

[2] Reference: 2017 National Emissions Inventory (NEI) Plan. https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-plan

APPENDIX E: Comparison and crosswalk: Control measures/waste treatment codes used in the NEI and TRI Reporting Programs

Comparison and Crosswalk: Control Measures/ Waste Treatment Codes used in the NEI and TRI Reporting Systems

INTRODUCTION

Control codes and waste treatment codes are data elements in the NEI and TRI, respectively, that allow data users to determine how facilities reduce or prevent releases of the chemicals or pollutants being used or created by the facility.

TRI facilities report the type and efficiency of waste treatment methods applied on-site to each waste stream containing TRI chemicals. Facilities report the type of waste stream, choosing from: gaseous, wastewater (aqueous waste), liquid waste streams (non-aqueous waste), or solid waste streams. They also report the treatment method or methods using 25 codes that correspond to different treatment methods. If the waste stream undergoes multiple treatment steps, they select all applicable codes in the treatment sequence.
For the NEI, SLTs report emissions of air pollutants and are required, where available, to report any control measures associated with a process or unit (for criteria pollutants). Multiple devices could be reported to a single process or unit. As of April 2018, the EIS has 124 active control codes, and 18 additional codes requested by OAQPS/SPPD are being added.

The purpose of this deliverable is to provide a map of the control codes between NEI and TRI and to make recommendations on how the common form would facilitate reporting of these controls/treatments in a way that would streamline TRI and SLT reporting and/or facilitate data sharing across program.
SLTs may have additional codes but we are assuming that the NEI codes will be a starting point in the common form.

METHODS

We have researched the existing control codes through internet searches and contacting colleagues in our respective offices that are more familiar with these codes. Special acknowledgements go to Larry Sorrels in EPA's Office of Air Quality Planning and Standards for guidance on the NEI control codes, and to Velu Senthil of the Office of Pollution Prevention and Toxics for providing summaries of facilities reporting the TRI treatment codes for air waste streams.

After understanding more about the technologies, we mapped control measures between the two programs. We allowed the same NEI control measure to be mapped to more than one TRI treatment code (adsorption and scrubbing) where a control measure could be considered to fit under multiple TRI treatments.
Table 1 maps TRI Waste Codes to NEI control measures. Table 2 maps NEI control measures to TRI waste codes. Both tables provide a best fit or default code, where appropriate. In some situations, it is not appropriate to provide a default due to a lack of a match.

RECOMMENDATIONS

3.1 For the CAER Common Form

The form should include a TRI waste treatment field, SLT/NEI control measure field and a comment field. If the reporter chooses to report using the TRI waste treatment codes, the form would provide a list of SLT/NEI control codes via a drop-down menu that shows the NEI control measure options associated with the TRI waste treatment option from Table 1. The facility would choose the NEI control measure from that drop down. The facility would be able to further describe the control using the comment field.

TRI Waste Treatment (Choose from drop down)	NEI Control Measure(s) (Choose from drop down -only NEI mapped controls are shown)	COMMENT (type in description of your treatment)	Form description (Form provides description of TRI Waste)
A01 – Flare	**23 – Flaring** 304 – Enclosed Combustor		This type of control is used in the oil & gas industry but can be used in other industrial operations as well.

If the reporter chooses to report using the SLT/NEI control measure field, the form would provide the waste treatment code that best matches the SLT/NEI from Table 2**.** The facility would be able to further describe the control using the comment field.

NEI Control Measure Code in EIS	TRI Waste Treatment Code	COMMENT (type in description of your treatment)
19 – Catalytic Afterburner	H040 – Incineration – thermal destruction other than use as a fuel	

3.2 Recommendations for the TRI treatment measures

1. A04 – Absorber and H103 – Absorption appear to be duplicative; one of these could be removed.
2. A07 – Other Air Emission Treatment and H129 – Other treatment also appear to have duplication; one of these could be removed
3. Add a treatment measure for sorbent injection. This technology is similar to scrubbers, but has its differences, and there are a growing number of sorbent injection measures available for use.
4. Any new codes should be clearly explained before they are added.
5. Existing codes should also be described (usage notes) and maintained in either EIS or a system (synaptica) as was done with the SCC codes.
6. Explore data for codes that appear to apply only to non-air streams that are being used for air streams. Particular codes are identified in the Comments field in TABLE 1.

3.3 Recommendations for NEI control measures

1. Add TRI codes to NEI for TRI Waste Treatment Codes for which there is no best fit/default value.
2. Any new codes should be clearly explained before they are added.
3. Existing codes should also be described (usage notes) and maintained in either EIS or a system (synaptica) as was done with the SCC codes.

MAPPING

TABLE 1. TRI WASTE CODES mapped to NEI CONTROL MEASURES

TRI Waste Treatment Codes	NEI Control Measure	Comments	Best Fit/Default
A01 – Flare	**23 – Flaring** 304 – Enclosed Combustor	An enclosed combustor is a type of flare. Used in oil and gas industry.	23
A02 – Condenser	110 – Vapor Recovery Unit **132 – Condenser**		132
A03 – Scrubber	35 – Magnesium Oxide Scrubbing 36 – Dual Alkali Scrubbing 38 – Ammonia Scrubbing 41 – Dry Limestone Injection 42 – Wet Limestone Injection 49 – Liquid Filtration System 57 – Dynamic Separator (wet) 67 – Wet Lime Slurry Scrubbing 68 – Alkaline Fly Ash Scrubbing 69 – Sodium Carbonate Scrubbing 70 – Sodium-Alkali Scrubbing 85 – Wet Cyclonic Separator 86 – Water Curtain 113 – Rotoclone 119 – Dry Scrubber 141 – Wet Scrubber 202 – Spray Dryer Adsorber (SDA) 206 – Dry Sorbent Injection (DSI, other than ACI) 215 – Flue gas desulfurization (FGD) 306 – Duct Sorbent Injection 307 – Furnace Sorbent Injection 308 – Wet Sorbent Injection	EPA retired the generic Scrubber code in 2013 timeframe.	
A04 – Absorber	50 – Packed-Gas Absorption Column 51 – Tray-Type Gas Absorption Column		
A05 – Electrostatic Precipitator	79 – Dry Electrostatic Granular Filter (DEGF) 128 – Electrostatic Precipitator - Dry (DESP) 146 – Electrostatic Precipitator - Wet (WESP) 218 – Electrostatic Spraying		
A06 – Mechanical Separation	56 – Dynamic Separator (Dry) 63 – Gravel Bed Filter 64 – Annular Ring Filter 66 – Molecular Sieve 75 – Cyclone / Centrifugal Collector 101 – High-Efficiency Particulate Air Filter (HEPA) 121 – Cyclones 127 – Fabric Filter / Baghouse 154 – Screened drums or Cages 157 – Screen 201 – Knock Out Box		

TRI Waste Treatment Codes	NEI Control Measure	Comments	Best Fit/Default
	209 – Gravity Collector 211 – Mist Eliminator 305 – Diesel Particulate Filters (DPF) 313 – Spray Booth and Filter 314 – Spray Booth and Overspray Arrestor 334 – Rotary Bed Protector		
A07 – Other Air Emission Treatment	25 – Staged combustion 26 – Flue Gas Recirculation 29 – Low Excess Air Firing 31 – Air Injection 46 – Process Change 87 – Nitrogen Blanket 88 – Conservation Vent 89 – Bottom Filling 93 – Submerged Filling 95 – White Paint 96 – Vapor Lock Balance Recovery System 97 – Secondary Seal on Floating Roof Tank **99 – Other Control Device** 102 – Low Solvent Coatings 103 – Powder Coatings 104 – Waterborne Coatings 139 – Selective Catalytic Reduction (SCR) 140 – Selective Non-catalytic Reduction (SNCR) 147 – Increased Air/Fuel Ratio with Intercooling 203 – Catalytic Converter 204 – Overfire Air 205 – Low NOx Burner (LNB) 208 – Freeboard Refrigeration Device 212 – Steam Injection 213 – Water Injection 214 – Low Nitrogen Content Fuel 217 – Dust Suppression 300 – Devices Repeated in Series 301 – Fuel reburning 303 – Catalytic Additives 309 – Leak Detection and Repair (LDAR) Program 310 – Non-Selective Catalytic Reduction (NSCR) 311 – Other Pollution Prevention Technique 315 – Spray Guns - High Volume, Low Pressure (HVLP) 316 – Ultra NOx Burners (ULNB) 318 – Product Substitution 321 – Cover Vented to Control Device 322 – External Floating Roof Tank		99

TRI Waste Treatment Codes	NEI Control Measure	Comments	Best Fit/Default
	323 – Fixed Roof Tank 324 – Fixed Roof Tank vented to Control Device 325 – Fixed Roof Tank with Internal Floating Roof 326 – Floating Membrane Cover 327 – Floating Roof 328 – Internal Floating Roof 329 – Multiple Controls in Series 330 – Pressurized Tank 331 – Process Modification 332 – Vapor Balancing		
H040 – Incineration – thermal destruction other than use as a fuel	19 – Catalytic Afterburner 20 – Catalytic Afterburner with Heat Exchanger 21 – Direct Flame Afterburner 22 – Direct Flame Afterburner with Heat Exchanger 109 – Catalytic Oxidizer / Incinerator 112 – Afterburner 133 – Thermal Oxidizer / Incinerator 149 – Pre-Combustion Chamber 317 – Recuperative Thermal Oxidizer 319 – Regenerative Thermal Oxidizer 320 – Combustion Device 333 – Thermal Catalytic Oxidizer without heat recovery 335 – Process Incineration in onsite unit (100% of exhaust gas) 336 – Process Incineration in onsite unit (<100% of exhaust gas) 337 – Thermal Catalytic Oxidizer		
H071 – Chemical reduction with or without precipitation	45 – Sulfur plant	Investigate the reporters of this code for air streams. Reported by 157 separate document control numbers (DCNs) in 2014 TRI. May also overlap with some scrubbing technologies but did not include them as this is mainly for waste water treatment. Chose sulfur plant because (this technology is neutralizing H2S). Do not know if there are other measures in this category that are for air waste streams. Would be useful to investigate this further	
H073 – Cyanide destruction with or without precipitation		Reported by 12 separate DCNs which is .03% of air waste streams. ASSUME this is mis-reported for AIR. Do not know how this is used for air waste streams. Would be useful to investigate this further	

TRI Waste Treatment Codes	NEI Control Measure	Comments	Best Fit/Default
H075 – Chemical oxidation	312 – Oxidation Catalyst	Chemical oxidation is a soil liquid/waste treatment. However, as an air control, oxidation is used in diesel fired reciprocal internal combustion engines and diesel vehicle exhaust.	312
H076 – Wet air oxidation		Reported by only 23 DCNs in 2014 TRI. Do not know how this is used for air waste streams. ASSUME this is mis-reported for AIR. Would be useful to investigate this further	
H077 – Other chemical precipitation with or without pre-treatment		This does not appear to be an air stream control; however, it is reported by 280 separate DCNs for air waste streams. Shows up at metal plating, among other industries. Vast majority are: NAICS Code 562211 Hazardous Waste Treatment and Disposal. Do not know how this is used for air waste streams. Would be useful to investigate this further.	
H081 – Biological treatment with or without precipitation	**302 – Biofilter**		302
H082 – Adsorption	**48 – Adsorption – Activated Carbon or Other** 202 – Spray Dryer Adsorber (SDA) 207 – Activated Carbon Injection (ACI)		48
H083 – Air or stream stripping		Reported by 121 separate DCNs for air waste streams). Majority are paper mills. Do not know how this is used for air waste streams. Would be useful to investigate this further. **Air stripping** is the transferring of volatile components of a liquid into an air stream. It is an environmental engineering technology used for the purification of groundwaters and wastewaters containing volatile compounds.	
H101 – Sludge treatment and/or dewatering	211 – Mist Eliminator 302 – Biofilter	Most likely not an air control, however, it was reported by 266 separate DCNs for air waste streams. Most frequent NAICS is 562211 (haz waste treatment).	
H103 – Absorption	50 – Packed-Gas Absorption Column 51 – Tray-Type Gas Absorption Column	Appears to duplicate A04 (possibly is an absorber for hazardous waste and listed separately than absorber for air treatment)	same as A04
H111 – Stabilization or chemical fixation prior to disposal		Reported by 261(separate DCNs for air waste streams). Most frequent NAICS is	

TRI Waste Treatment Codes	NEI Control Measure	Comments	Best Fit/Default
		562211 (haz waste treatment). But do not know how this is used for air waste streams. Would be useful to investigate this further.	
H112 – Macro-encapsulation prior to disposal		Does not apply to air emissions. No one reports	
H121 – Neutralization	35 – Magnesium Oxide Scrubbing 36 – Dual Alkali Scrubbing 38 – Ammonia Scrubbing 45 – Sulfur Plant 67 – Wet Lime Slurry Scrubbing 68 – Alkaline Fly Ash Scrubbing 69 – Sodium Carbonate Scrubbing 70 – Sodium-Alkali Scrubbing 82 – Ozonation 141 – Wet Scrubber	Reported by 733 separate DCNs for air waste streams. Chose to repeat some scrubbing technologies which could work through neutralization.	
H122 – Evaporation		Reported by only 23 DCNs. Do not know how it would be an air stream treatment. ASSUME it is mis-reported for AIR.	
H123 – Settling or clarification	132 – Condenser	Reported by 601 separate DCNs for air waste streams. Mostly by EGUs and haz waste treatment. This device could be a refrigerated condenser, which is a VOC control measure. Thus, code 132 may be applicable here. However, there may be other ways this would be used for an air stream treatment. Would be useful to investigate this further	
H124 – Phase separation		Reported by 68 separate DCNs for air waste streams). 10 refineries. ASSUME it is mis-reported for AIR Would be useful to investigate this further	N/A
H129 – Other treatment	Use same exact list as A07		99

TABLE 2. NEI control measures mapped to TRI Waste codes

NEI Control Measure Code in EIS	TRI Waste Treatment Code	Comments	Best fit
19 – Catalytic Afterburner	H040 – Incineration – thermal destruction other than use as a fuel		H040
20 – Catalytic Afterburner with Heat Exchanger	H040 – Incineration – thermal destruction other than use as a fuel		H040

NEI Control Measure Code in EIS	TRI Waste Treatment Code	Comments	Best fit
21 – Direct Flame Afterburner	H040 – Incineration – thermal destruction other than use as a fuel		H040
22 – Direct Flame Afterburner with Heat Exchanger	H040 – Incineration – thermal destruction other than use as a fuel		H040
23 – Flaring	A01 – Flare		A01
25 – Staged Combustion		It is for NOX	A07
26 – Flue Gas Recirculation	N/A – applies only to NOX However, to be complete, use A07	***Flue gas recirculation*** (FGR) is a highly effective technique used for lowering Nitrogen Oxide (NOx) emissions from burners. This is particularly crucial, as NOx is a significant pervasive pollutant that produces a negative array of health and environmental by-products. FGR only applies for NOx.	A07
29 – Low Excess Air Firing			A07
31 – Air injection		Secondary **air injection** (commonly known as **air injection**) is a vehicle emissions control strategy introduced in 1966, wherein fresh **air** is **injected** into the exhaust stream to allow for a fuller combustion of exhaust gases	A07
35 – Magnesium Oxide Scrubbing	A03 – Scrubber		A03
36 – Dual Alkali Scrubbing	A03 – Scrubber		A03
38 – Ammonia Scrubbing	A03 – Scrubber		A03
41 – Dry Limestone Injection	A03 – Scrubber		A03
42 – Wet Limestone Injection	A03 – Scrubber		A03
45 – Sulfur Plant	H071 – Chemical reduction with or without precipitation	Sulfur recovery plant recovers the sulfur in the form of liquid, flake or pellet by combining the variety of hydrogen sulfide removal plant in the upper and the down stream from petroleum gas, coal gas, natural gas, off-gas from various petrochemical or chemical plants and the vapor emissions from geothermal power plant. The Claus **process** is a catalytic **chemical process** that is used for converting gaseous hydrogen sulfide (H2S) into elemental sulfur (S). The **process** is commonly referred to as a **sulfur recovery unit** (SRU) and is very widely used to produce sulfur from the hydrogen sulfide found in raw natural gas and from the by-product	
46 – Process Change			A07

NEI Control Measure Code in EIS	TRI Waste Treatment Code	Comments	Best fit
48 – Adsorption – Activated Carbon or Other	H082 – Adsorption		H082
49 – Liquid Filtration System	A03 – Scrubber		A03
50 – Packed-Gas Absorption Column	A04 – Absorber		A04
51 – Tray-Type Gas Absorption Column	A04 – Absorber		A04
52 – Spray Tower	A04 – Absorber		A04
54 – Process Enclosed			A07
56 – Dynamic Separator (Dry)	A06 – Mechanical Separation		A06
57 – Dynamic Separator (wet)	A03 – Scrubber		A03
58 – Mat or Panel Filter	A06 – Mechanical Separation		A06
59 – Metal Fabric Filter Screen (Cotton Gins)	A06 – Mechanical Separation		A06
60 – Process Gas Recovery			A07
63 – Gravel Bed Filter	A06 – Mechanical Separation		A06
64 – Annular Ring Filter	A06 – Mechanical Separation		A06
65 – Catalytic Reduction		NEI guidance is that this is for SO2 and use more specific code for NOX (e.g., SCR)	A07
66 – Molecular Sieve	A06 – Mechanical Separation		A06
67 – Wet Lime Slurry Scrubbing	A03 – Scrubber		A03
68 – Alkaline Fly Ash Scrubbing	A03 – Scrubber		A03
69 – Sodium Carbonate Scrubbing	A03 – Scrubber		A03
70 – Sodium Alkali Scrubbing	A03 – Scrubber		A03
75 – Cyclone / Centrifugal Collector	A06 – Mechanical Separation		A06
79 – Dry Electrostatic Granular Filter (DEGF)	A05 – Electrostatic Precipitator		A05
82 – Ozonation			A07
85 – Wet Cyclonic Separator			A03
86 – Water Curtain			A03
87 – Nitrogen Blanket			A07
88 – Conservation Vent			A07
89 – Bottom Filling			A07
93 – Submerged Filling			A07
95 – White Paint			A07
96 – Vapor Lock Balance Recovery System			A07
97 – Secondary Seal on Floating Roof Tank			A07
99 – Other Control Device	H129 – Other treatment		A07

NEI Control Measure Code in EIS	TRI Waste Treatment Code	Comments	Best fit
101 – High-Efficiency Particulate Air Filter (HEPA)	A06 – Mechanical Separation		A06
102 – Low Solvent Coatings	H129 – Other treatment		A07
103 – Powder Coatings	H129 – Other treatment		A07
104 – Waterborne Coatings	H129 – Other treatment		A07
109 – Catalytic Oxidizer / Incinerator	H040 – Incineration – thermal destruction other than use as a fuel		H040
110 – Vapor Recovery Unit	A02 – Condenser	A02 – Condenser A VRU, or **vapor recovery unit**, is a compression system used to collect and compress low volume gas streams for injection into the suction of a larger compressor, a meter run, a local site fuel gas system or directly into a gas gathering line. **vapor recovery unit**. A **system** composed of a scrubber, a compressor and a switch. Its main **purpose** is to recover **vapors** formed inside completely sealed crude oil or condensate tanks. The switch detects pressure variations inside the tanks and turns the compressor on and off.	A02
112 – Afterburner	H040 – Incineration – thermal destruction other than use as a fuel		H040
113 – Rotoclone	A07 – Other Air Emission Treatment		A03
119 – Dry Scrubber	A03 – Scrubber		A03
121 – Cyclones	A06 – Mechanical Separation		A06
127 – Fabric Filter / Baghouse	A06 – Mechanical Separation		A06
128 – Electrostatic Precipitator – Dry (DESP)	A05 – Electrostatic Precipitator		A05
132 – Condenser	A02 – Condenser		A02
133 – Thermal Oxidizer / Incinerator	H040 – Incineration – thermal destruction other than use as a fuel		H040
139 – Selective Catalytic Reduction (SCR)			A07
140 – Selective Non-catalytic Reduction (SNCR)			A07
141 – Wet Scrubber	A03 – Scrubber		A03
146 – Electrostatic Precipitator – Wet (WESP)	A05 – Electrostatic Precipitator		A05
147 – Increased Air/Fuel Ratio with Intercooling			A07

NEI Control Measure Code in EIS	TRI Waste Treatment Code	Comments	Best fit
149 – Pre-Combustion Chamber	H040 – Incineration – thermal destruction other than use as a fuel		H040
154 – Screened drums or Cages	A06 – Mechanical Separation		A06
157 – Screen	A06 – Mechanical Separation		A06
201 – Knock Out Box	A06 – Mechanical Separation		A06
202 – Spray Dryer Adsorber (SDA)	H082 – Adsorption		H082
203 – Catalytic Converter			A07
204 – Overfire Air	H040 – Incineration – thermal destruction other than use as a fuel	Similar to staged combustion	A07
205 – Low NOx Burner (LNB)	H040 – Incineration – thermal destruction other than use as a fuel		A07
206 – Dry Sorbent Injection (DSI, other than ACI)	H082 – Adsorption		H082
207 – Activated Carbon Injection (ACI)	H082 – Adsorption		H082
208 – Freeboard Refrigeration Device	H123 – Settling or clarification		H123
209 – Gravity Collector	H123 – Settling or clarification		A06
211 – Mist Eliminator	A06 – Mechanical Separation	Mist elimination or "demisting" can be defined as the mechanical separation or removal of liquid droplets or mists from vapor streams. http://www.kimre.com/blog/mist-eliminator-manufacturers-helping-to-achieve-a-clean-environment/	A06
212 – Steam Injection		NOX control, combustion turbine Water or steam injected in combustion zone reduces temperature and nitrogen oxide formation (applied to gas turbines) (https://www3.epa.gov/ ttn/emc/meetnw/2013/2013t3.pdf)	A07
213 – Water Injection		NOX control, combustion turbine Water or steam injected in combustion zone reduces temperature and nitrogen oxide formation (applied to gas turbines) (https://www3.epa.gov/ ttn/emc/meetnw/2013/2013t3.pdf)	A07
214 – Low Nitrogen Content Fuel	A07 – Other Air Emission Treatment		A07
215 – Flue Gas Desulfurization (FGD)	A03 – Scrubber		A03
217 – Dust Suppression	A07 – Other Air Emission Treatment	Dust suppression is a technique to reduce fugitive dust formation (mostly PM). Examples are on road surfaces	A07

NEI Control Measure Code in EIS	TRI Waste Treatment Code	Comments	Best fit
218 – Electrostatic Spraying	A05 – Electrostatic Precipitator		A05
300 – Devices Repeated in Series			A07
301 – Fuel Reburning			A07
302 – Biofilter	H081 – Biological treatment with or without precipitation		H081
303 – Catalytic Additives			A07
304 – Enclosed Combustor	A01 – Flare		A01
305 – Diesel Particulate Filters (DPF)	A06 – Mechanical Separation		A06
306 – Duct Sorbent Injection	A03 – Scrubber		A03
307 – Furnace Sorbent Injection	A03 – Scrubber		A03
308 – Wet Sorbent Injection	A03 – Scrubber		A03
309 – Leak Detection and Repair (LDAR) Program			A07
310 – Non-Selective Catalytic Reduction			A07
311 – Other Pollution Prevention Technique	A07 – Other Air Emission Treatment		A07
312 – Oxidation Catalyst			A07
313 – Spray Booth and Filter	A06 – Mechanical Separation		A06
314 – Spray Booth and Overspray Arrestor	A06 – Mechanical Separation		A06
315 – Spray Guns - High Volume, Low Pressure (HVLP)	A07 – Other Air Emission Treatment		A07
316 – Ultra NOx Burners (ULNB)	A07 – Other Air Emission Treatment		A07
317 – Recuperative Thermal Oxidizer	H040 – Incineration – thermal destruction other than use as a fuel		H040
318 – Product Substitution	A07 – Other Air Emission Treatment		A07
319 – Regenerative Thermal Oxidizer	H040 – Incineration – thermal destruction other than use as a fuel		H040
320 – Combustion Device	H040 – Incineration – thermal destruction other than use as a fuel		H040
321 – Cover Vented to Control Device			A07
322 – External Floating Roof Tank			A07
323 – Fixed Roof Tank			A07
324 – Fixed Roof Tank Vented to Control Device			A07

NEI Control Measure Code in EIS	TRI Waste Treatment Code	Comments	Best fit
325 – Fixed Roof Tank with Internal Floating Roof			A07
326 – Floating Membrane Cover			A07
327 – Floating Roof			A07
328 – Internal Floating Roof			A07
329 – Multiple Controls in Series			A07
330 – Pressurized Tank			A07
331 – Process Modification			A07
332 – Vapor Balancing			A07
333 – Thermal Catalytic Oxidizer without heat recovery	H040 – Incineration – thermal destruction other than use as a fuel		H040
334 – Rotary Bed Protector	A06 – Mechanical Separation		H082
335 – Process Incineration in onsite unit (100% of exhaust gas)	H040 – Incineration – thermal destruction other than use as a fuel		H040
336 – Process Incineration in onsite unit (<100% of exhaust gas)	H040 – Incineration – thermal destruction other than use as a fuel		H040
337 – Thermal Catalytic Oxidizer	H040 – Incineration – thermal destruction other than use as a fuel		H040

APPENDIX F: Cross-program Data Quality: Process Survey and Recommendations

Cross-program Data Quality Processes: Data Quality Process Survey and Recommendations

Background on Team Survey and Process

The CAER R&D State/Local/Tribal (SLT), National Emissions Inventory (NEI), & Toxics Release Inventory (TRI) team surveyed EPA program and regional offices to see whether and how different offices implement data quality assurance (QA) for their reporting programs using data from other reporting programs. This survey is intended to help inform the SLT/NEI/TRI team's report on recommendations for cross-program data sharing and QA calls as part of the CAER program. The EPA staff survey responses are included in Attachment 1.

While we did not choose to survey state programs, we received feedback from state representatives on our team or on the broader Product Design Team that either use TRI data for their state data purposes or comment on the process. We also received a general information document from the Texas Commission on Environmental Quality (TCEQ) on some differences between the TRI and the Texas point source emissions inventory (EI) programs (Attachment 2). We included this as an example of guidance developed by an SLT office for considerations when comparing TRI and EI data.

Using input from state representatives, along with the survey responses from EPA staff, we developed a summary of findings and recommendations on QA processes and cross program coordination related to QA processes.

This report includes:

- Details on the NEI-TRI QA survey distributed to specific EPA staff
- A high-level summary of the survey responses
- Summary of key findings
- Recommendations for future cross-program data sharing for the purposes of improving data quality
- All survey responses in full, submitted anonymously by staff (Attachment 1)

Survey Details

The first step was determining the questions related to the QA processes of the NEI and TRI programs. The SLT/NEI/TRI team finalized a list of questions focusing on emissions data used from other programs for QA, how staff determines which facilities require follow-up, and how staff interprets or handles any significant data discrepancies across programs. These questions were emailed to EPA staff within those program offices and in the EPA regions.

The survey questions were:

1. Describe the data you use from programs and how you use it for QA.

2. Describe the staff involved and your process for coordinating with them to gather information. Staff include: Other EPA staff (regions, others in your program/office or other EPA offices), state agency staff, facility staff.

3. When did you start using other emissions data for QA and how effective has it been in your QA process? Please comment on the following specific examples in your response:
    a. Have you found differences in emissions or lack of reporting due to program requirements versus errors in reporting or noncompliance?
    b. Have you found more errors in the other programs' emissions data than yours?
    c. What changes have you made in the QA process since you started it?
    d. Are you considering any changes to your process? If yes, please briefly describe.
    e. Do you have any recommendations to improve your process?

4. What criteria do you use to decide who (facility or state) to call or follow up with?
    a. If you send out a list, what is the criteria for the facility to be on the list?
    b. Does the same procedure happen each time you do the QA process?

5. What do you do when you see a difference?

6. If you see differences in the data, how do you determine which is right? Do you follow up with the facility, follow up with the other program, change your data (not in TRI but is possible in NEI, e.g., mercury from gold mines)?

7. What is the timing and how long does your process take?
    a. Is the QA process a one-shot deal? What happens when a facility resubmits/changes data in TRI (or NEI)?
    b. What is the deadline to make data changes to NEI and TRI?
    c. Do you use 2014 data for other years? If yes, please briefly describe.

8. Do you have a pollutant or facility watch list for use in your QA process? If yes what is it based on? Examples include: sectors that have had problems in the past, emissions threshold or risk, pollutant based on risk.

9. Do you have any general thoughts on your QA process or potential improvements?

High-Level Survey Responses Summary

Six survey responses were received from EPA staff in the NEI and TRI programs and within regional offices: one was from the TRI program, two from the NEI programs, and three from regional programs.

Survey results show that there are no broad similarities between the programmatic offices and across the regions. The survey responses reflect the differences in how offices use various data for QA purposes, whether they follow an outlined QA process, what such a process entails, and the timeline for any data quality checks. Overall, respondents also varied in their support for comparing TRI and NEI data for QA, with some staff regularly using the cross-program comparisons, and other staff pointing out the regulatory and reporting differences between the programs as bases for not utilizing the NEI/TRI comparisons for QA.

Findings from this survey reflect a variety of QA approaches and priorities. Programmatic offices and regional offices each have their own QA processes and priorities related to data quality and potential enforcement concerns. One commonality across all survey responses was that no programmatic office or regional office operates completely siloed from others. Each respondent, even those who may not compare NEI and TRI data for QA, still rely in part on input and direction from other offices. The TRI office uses data from many other reporting programs, including NEI, to compare with TRI reports, and receives input from regions and the EPA's Office of Enforcement and Compliance Assurance (OECA) on any priorities from their offices (e.g., specific industries or chemicals). Similarly, the NEI program respondents may use TRI data for emissions comparisons or for NEI data gap-filling and largely coordinates their efforts with SLT staff. From the regional offices, respondents indicated their annual TRI data quality (DQ) calls to verify the accuracy of TRI data submissions are largely based on lists developed by the TRI program office, although the regions may differ in the number of calls or check-ups they pursue. These follow-up calls with facilities are typically triggered by possible data quality issues, and the calls are required by EPA to support TRI data quality.

Full survey responses are provided in Attachment 1. High-level summaries of each question are below.

Question/Topic	Responses Summary	
	Program Offices (NEI & TRI)	**Regional Offices—TRI Coordinators**
Data used for QA	Data from multiple programs are used for comparison (e.g., NEI, TRI, CAMD-CEM[1], GHGRP[2], RMP[3]). Both TRI and NEI use the other program's data, but both programs also cite data the other program did not.	Some regions use NEI data for TRI data quality checks, but not all. Some regions also cited using other programs' data (e.g., RCRA[4]) in their TRI data quality checks.
Staff/office coordination for QA	The NEI program works closely with SLT staff for QA, and has occasionally coordinated with EPA regional staff. The TRI program coordinates with EPA regional staff for their data quality efforts. The programs have communicated with each other to exchange and analyze the other program's data. The program also coordinates with other offices in EPA for running initial data analyses and getting feedback for any compliance efforts.	Regional offices work closely with the TRI program for TRI data quality calls, both in providing input for any regional priorities when the office develops its list of facilities to call, and in assisting with the required data quality resolutions for at least 650 facilities.
Timeline of QA process	For both reporting programs, the entire QA process typically takes about six months from when reporting data is received.	The timeline for regions involved in data quality efforts varies. For regions completing hundreds of data quality calls and follow-ups, the entire process takes approximately three months from when they receive their list of facilities from the program office. Regions completing fewer data quality calls will take less time.
Prioritizing follow-up calls with facilities	The TRI program prioritizes following up with facilities with significant reporting differences from the previous year. The program also follows up with facilities that have a large (>25%) discrepancy in reported emissions to TRI and other reporting programs. Other follow-ups are due to facilities reporting the same precise quantity for three consecutive years, or significant differences between a facility's reported maximum on-site quantity and the sum of releases. The NEI program also follows up with SLTs with large reported differences for specific chemicals (e.g., mercury).	This varies by regional office, based on time demands and management focus. Not all regions perform QA for TRI data or follow-up with facilities beyond what is directed by the program offices, given limited time and resources.
Changes in QA process over time	2018 was the first time that comparisons of NEI and TRI data were used for the TRI QA calls.	QA calls for 2018 were the first that some regions called facilities to confirm their TRI data compared to what the SLT submitted to the NEI. Some regions have also stopped using certain data (e.g., DMR[5]) to compare with TRI data, noting that the reporting scenarios do not overlap between the programs.
Other observations		One region noted that TRI/NEI data comparisons may be more helpful to identify non-reporters to TRI, as the reporting requirements and logistics of the TRI and NEI programs often result in different but valid reported data.

[1] Clean Air Markets Divisions – Continuous Emissions Monitoring
[2] Greenhouse Gas Reporting Program
[3] Risk Management Plan
[4] Resource Conservation and Recovery Act
[5] Discharge Monitoring Report

Key Findings

1. Within programs, QA focuses or processes may differ. Regional focuses also vary, based on other work and the number and type of facilities in the region.
2. From the program office side, the QA process is around 6 months; regional offices spend around 3 months.
3. Sometimes facilities were surprised to hear their TRI and NEI data are very different, especially when they claim to have provided emissions data to SLT that wasn't what the SLT submitted to the NEI.
4. Differences between TRI and NEI data may be due to different emission factors used by the programs.
5. TRI works more closely with regions for data quality calls; NEI works more with SLT for QA.
6. The reporting cycles & requirements do not align perfectly, making it difficult to compare apples-to-apples data for each reporting program.
7. At least one state (Texas) compares facilities' TRI data to EI data as part of their QA process.

Recommendations

1. More information should be provided to staff and facilities as to why NEI/TRI data are being compared, and the limitations of such comparisons. Because 2018 was the first year for some regions to ask facilities to confirm their reported TRI data as compared to the NEI data that were submitted by the SLT, it would benefit staff to provide greater background and clarity on what the goal and expectation are of such data comparisons. Goals and expectations are especially needed with regards to possible compliance and/or enforcement actions. Some specific action items are:
   - Prepare an informal information document on why there will be differences and recommendations for prioritizing which to follow up on. Consider including the case study documents and metrics documents as references and get ideas from related documents such as the TCEQ information document "Toxics Release Inventory and Texas Point Source Emissions Inventory Comparison" (Attachment 2).
   - Compare treatment/control method codes; look at treatment codes reported for air releases that don't appear to fit (based on control code mapping deliverable).
   - Use the same year of data when doing comparisons, where possible. For example, if there is a 2016 TRI data quality issue based on information from 2014 NEI, then more updated information should be pursued before sending out the issue to facility.
   - When comparing emissions, care should be taken to address differences in different ways pollutant groups are treated. When comparing emissions of HCN and CN, for example, the two pollutants should be summed because of inconsistent treatment across SLT. Some SLT treat CN as total (including HCN) and others do not. The pollutant grouping procedures used for the NEI/TRI emissions comparisons (Appendix B of the CAER SLT/NEI/TRI Phase 2 Final Report) can be used as guidance.
   - Notify the SLT staff (e.g., EIS users) if a regional office is or will be making DQ calls to facilities in that state.
   - SLTs that compare their EI data to TRI as part of their QA process may want to notify facilities that they may receive calls from SLT to follow up on differences they may find.

2. More information with respect to how a facility's NEI data were obtained should be provided to the staff involved in the data quality efforts for both TRI and NEI air emissions data. That information should also be relayed to the facility in the event the facility is contacted for DQ calls. Available information includes method calculation code, which process is driving emissions (or provide process-level information), who provided the information. Ideally it would be useful to know if the value was computed by the SLT or provided to the SLT by the facility (but that information is not part of the NEI and would require follow up with SLT).

3. To reduce burden and time spent contacting facilities, additional data reviews may be needed prior to contacting facilities to confirm that any data discrepancies are valid given the reporting programs' different requirements and regulations.

4. Greater coordination between TRI, NEI, and SLT staff for scheduling products and upcoming QA activities will help improve QA process efficiencies, as well as potentially identifying additional data to compare between different reporting programs for QA purposes. In particular:
   - Maintenance of completed EIS-TRIFID crosswalk needs to be handled by a database (automated). Automation would include tasks such as tracking facility merges (both systems), mapping to new IDs, new facilities/closures/sub-entity changes, etc.
   - SLT staff may considering using the October/November or earlier version of TRI data for initial QA of their inventories before they submit to EIS with EPA providing data and/or instructions. One way to do this is could be by EPA/OAQPS loading the October/November version of TRI data into EIS during the October/November timeframe. Once SLT EI data are submitted to EIS, staff could compare using an EIS comparison report and determining which data discrepancies should be prioritized for review and potential follow-up. Some priorities for review may include health risk values and/or magnitude of differences between TRI and SLT EI data.
   - Analyses between TRI & NEI (including for DQ calls) should pay attention to the version of the TRI file being used; since TRI typically updates public data files (following QA efforts) at least twice each year, data users should make sure to check the data file upload date (from the TRI website/Envirofacts) or the date a facility submitted a revision (found in TRI Customized Query).

5. When TRI data is pulled for gap-filling in the NEI, NEI will have to assign some default parameters (e.g., stack height, stack temperature) due to differences in reported data elements for TRI. In the long-term, having more precise and facility-specific parameters assigned to these facilities' NEI data would improve the data quality. Once established, these parameters should be shared and utilized across all programs.

6. It would be helpful to have a common set of emission factors for use in TRI SLT EI and NEI programs. WebFIRE and AP-42 are the bases of emission factors for SLT EIs. They should be up to date. For example, the Electric Power Research Institute (EPRI) and the National Council for Air and Stream Improvement (NCASI) frequently update emission factors for electric generating processes and pulp & paper, respectively. Effort needs to be taken on updating the national emission factor repository with emission factors from EPRI, NCASI, and others.

7. Under a common emissions form (CEF) scenario in which a facility is providing emissions to the SLT: the reporting software could show the most recent air releases submitted by the facility to TRI, compared to

the facility's aggregated CEF emissions (i.e., stack and fugitive). The CEF could also allow the facility to select the previous data to pre-populate if appropriate.

Attachment 1: Original Survey Results

1. **Describe the data you use from programs and how you use it for QA.**
   - I pull emissions data each year from the public web site postings by TRI, CAMD-CEM [Clean Air Markets Division—Continuous Emissions Monitoring], and GHGRP [Greenhouse Gas Reporting Program] websites. The goal is to get emissions data that can be used to fill gaps where S/Ls have not reported, rather than to QA the S/L reported data. But as part of a larger comparison flagging exercise back to the S/L reporters (mostly comparing their current submitted data to our last NEI year), I do include comparisons to show where TRI and CAMD values differ by more than 25% from the S/L reported values, at Facility-total level.
   - In 2016, [the region] compared 2014 NEI data to 2014 TRI data to find TRI non-reporters for specific PBT chemicals (mostly lead and mercury). This Regional comparison resulted in the discovery of several TRI non-reporters for potential enforcement action. In 2018, EPA's National TRI Program developed a list of facilities found on the 2014 NEI list that were either: not found on the RY2016 TRI or reported at much different levels compared to 2016 TRI.
   - Don't generally use TRI data for QA-ing NEI because I am not an NEI developer. Exception is for mercury emissions in NEI. I work with TRI/NEI comparisons in 4 ways.
     - During NATA [National Air Toxics Assessment] review I will check an NEI facility from time to time to see if TRI is showing similar values to SLT-reported or I will use TRI to look at later emissions values to see if emissions have gone down in years after the NEI inventory year since TRI has later data.
     - During NATA review there are facilities with TRI data that SLT ask EPA to check and I ask Velu Senthil to check these. At times I will ask TRI Regional staff to check.
     - Check for possible missing Hg in the NEI
     - Participated in the TRI review by providing data to the TRI program from the NEI and I have discussed data from the NEI with TRI staff.
   - The [regional] TRI Program (non-enforcement) does not currently initiate quality assurance. [The region] relies on data quality requests from the national TRI program.
   - Am just beginning to identify RCRA LQG (large quantity generators) from ECHO and matching to TRI for a joint EPCRA / RCRA investigation for enforcement targets. Once upon a time I attempted to use the DMR tool, i.e., water discharge info, but discovered much discharge data is worst case scenario, if I remember correctly, and therefore does not reflect what is actually reported in TRI. Same is true with NEI data in that NEI is determined in different ways to TRI. Therefore, it's like comparing apples to oranges. More often than not, chemicals that are coincidentally manufactured have to be reported to NEI but are well below the 25,000 pound threshold for TRI. In addition, some chemicals reported to NEI are not TRI chemicals.

     What is inherently WRONG WITH NEI or why is it unreliable? First and foremost, the data comes to EPA second hand! It's my understanding that the facility submits their emissions data to the state, and the state in turn sends that data to EPA, i.e., NEI. The caveat to all this is that if the state does not like what they see, they change the data without telling the facility, and once NEI gets the data, if they do not like what they see, NEI also changes the data that has already been changed, also without tell either the facility or the state I presume. Now tell me, what kind of mess does that put that data in!! Oftentimes, I hear facilities say, regarding the data that NEI has provided to the TRI Program, "that is not the data I submitted to the state!"

- Use data from TRI, NEI, DMR [Discharge Monitoring Report], CDR [Chemical Data Reporting], RMP [Risk Management Plan], Tier II, US Energy Information Administration (for coal-fired electricity generating facilities)

2. **Describe the staff involved and your process for coordinating with them to gather information. Staff include: Other EPA staff (Regions, others in your program/office or other EPA offices), states agency staff, facility staff.**
   - There is no staff involved from the TRI, CAMD-CEM, or GHGRP offices – the public-posted data is obtained.
   - Each year, [regional] staff coordinates with the National TRI Program to conduct hundreds of QA calls in our Region. In 2018, most of the calls conducted were related to comparing 2014 NEI emissions data with TRI data.
   - NATA review is highly coordinated with SLT. SLT are asked to review their and TRI data, but many indicate that they don't have resources to review TRI data and they ask EPA to do that. I coordinate with Velu for review of the TRI facilities in the NEI that are high priority for NATA and for which SLT indicate that they cannot do the review for (resources, or not their data so not their responsibility) and 2) Provide TRI to NEI comparisons for use in his DQ effort (for which I do not know the details). I have coordinated with a few TRI regional staff on specific facilities that originally came back from the review as "no change" when I felt that the emissions were likely misestimated. This included [two facilities from different regions]. Coordinate with [the TRI program] for some Hg issues (gold mines). For other Hg issues (missing EAFs) I notify SLT when I gap fill NEI using TRI data. For reviewing information with TRI program staff, I have coordinated with [the TRI program] and answered questions from TRI Regional staff.
   - Regarding quality assurance of TRI data, the [regional] TRI Program coordinates with other offices within [the region] to discuss the suitability and context of potential data quality requests from headquarters. This includes the TRI and other enforcement programs, as well as permitting staff. We have not reached out to state offices specifically regarding TRI reported data for quality concerns, as states are not delegated TRI.
   - No state agencies in [the region] have ever been involved with EPCRA/TRI targeting or quality assurance of data. Of late, the TRI Program is mandated to work with RCRA for targeting, inspections, and enforcement actions. To date, have not been involved with either air or water for EPCRA / TRI purposes.
   - Each year, OEI does data runs for Velu [with the TRI program] shortly after reporting forms are submitted July 1. [The TRI program] gets input from regions on any specific issues to focus on for their region (e.g., an industry sector), but they mostly determine which facilities to call and sends those to the regions. The number of DQ calls the regions make varies—sometimes regions choose to call every facility on their list (of possibly hundreds), others may not call as many. The only mandatory goal for

annual DQ calls is that 650 facilities need to be fully resolved (i.e., not just called). He also generates a list of possible non-reporters, when compared to prior year forms: After filtering facilities that provided any info from the prior year form's optional free text box that may explain why a facility won't report in the current year, [the TRI program] works with the Office of Enforcement & Compliance Assurance to determine if they'll pursue any of them given current priorities, then sends the list to the region.

3. **When did you start using other emissions data for QA and how effective has it been in your QA process?**
   - 1996 for CAMD; 2011 for TRI; 2013 for GHGRP. It has not been very effective as a QA step, because we don't use it for that, but rather for gap-filling. We did use data initially for insuring that we had correct matches and correct lat/long info in EIS for those facilities, and that was effective.
   - 2011 NATA
   - Have NOT used other emissions data for it's like comparing apples to oranges.

4. **Please comment on the following specific examples in your response:**
   a. **Have you found differences in emissions or lack of reporting due to program requirements versus errors in reporting or noncompliance?**
   - The Clean Air Act requires State Agencies to report all Hazardous and Criteria air pollutants for all industrial sectors to NEI every three years. TRI requires a subset of all facilities to directly report to EPA each year. In addition, for most chemicals, facilities do not have to report unless they process more than 25,000 pounds of that chemical, or otherwise use 10,000 pounds. In short, while data on all facilities may be found in NEI, many facilities are not required to report to TRI.
   - Have not evaluated reasons for missing or different values.
   - I am aware of differences due to reporting requirements, errors in reporting and noncompliance with TRI. For example, mercury is not reported by some states with EAFs to Ohio and Pennsylvania. Some of these PA and OH facilities report to TRI so I use those emissions. Presumably this is different reporting requirements (facility to state versus faciality to TRI). I am aware of errors in TRI reporting (NATA situation). I am aware of TRI non-compliance cases. … I do not know if any TRI noncompliance came out of the more recent DQ call. Most TRI pollutants are HAPs that are not required to be reported by SLT to NEI. To my knowledge no one has checked whether SLT were not compliant with requirements for reporting lead or NH3 based on using TRI.
   - [The regional] program does not use other emissions data for quality assurance. We do not know if TRI enforcement does.
   - No – There have been legitimate reasons why the facility did not have to report to TRI, although they did report to NEI.
   - Some examples of discrepancies aren't always due to reporting requirement differences. [The TRI program] works to make sure none of the reporting errors/non-compliance is due to reporting software bugs. This has been the cause for errors for about 50 facilities/year, but appears to be going down with continued work on TRI-MEweb and more integrated error checking.

   b. **Have you found more errors in the other programs' emissions data than yours?**

- Cannot determine which program's data is in error. I suspect many of the differences may be due to differences in reporting requirements, so I don't know that these are errors.
- Since the State Agencies are required to populate NEI, the NEI data appears to be more reliable than the facility-reported data of TRI.
- In 1 instance of about 50, the facility did say TRI data was correct and they were going to change their NEI numbers.
- Not applicable.

c. What changes have you made in the QA process since you started it?

- None
- After reaching out to facilities on NEI/TRI discrepancies, we've found that we have to explain the background of the NEI program Specifically, the States may have reported different emission rates than what the facility reported to them via their Annual Emissions Report.
- Not applicable.
- Between targeting, enforcement, helping other programs with supplying them with TRI data, I simply don't have time, personally, to conduct QA on TRI data.

d. Are you considering any changes to your process? If yes, please briefly describe.

- No.
- For future NEI/TRI comparison QA calls, [the region] suggests that we focus on TRI non-reporters only. Differences in emission rates between NEI and TRI are often due to the use of different valid emission factors.
- Not applicable.
- Not applicable.
- Not really – will tighten difference % to 10% for CAMD-State data for flags, rather than 25%.

e. Do you have any recommendations to improve your process?

- No
- Many facilities who we contact have difficulty in accessing the NEI data. … The spreadsheet is very large and can't be emailed due to size restrictions. Is there a way to make to this data easier to access?
- Provide more info on where NEI emissions are from when I give data to [the TRI program] for the DQ process. However, there appear to be many at Regional offices that think this is not a valid/worthwhile comparison, so it is not clear that it will continue.
- Not applicable.
- Between targeting, enforcement, helping other programs with supplying them with TRI data, I simply don't have time, personally, to conduct QA on TRI data.

5. What criteria do you use to decide who (facility or state) to call or follow up with?

- No follow-up with SLTs or facilities.
- The TRI National Program chooses the largest emission rate discrepancies between NEI and TRI. There are also many TRI non-reporters, who report to NEI.

- NATA priority facilities or facilities with Hg differences.
- We do not compare emissions data with TRI data outside of the TRI national ad hoc or National Analysis data quality.
- Primarily focuses on changes over prior year, including missing chemicals and facilities. About 20 analyses are used to mine the TRI forms, and data are broken down by industry sector (looking at the top approximately 20-25 facilities in each). These are run mostly by [two people] in the TRI program and the Office of Environmental Information. These include: 1.) using RSEI (Risk-Screen Environmental Indicators) toxicity weights for chemicals, looking at the top ~20 for each sector. If there are any commonly-occurring facilities, they may get a DQ call to make sure those reports are accurate, due to their relatively high-risk data submitted, and 2.) looking at total releases from production-related waste, at an industry level. This includes changes in air releases, water releases, and non-RCRA land releases (e.g., surface impoundments, other landfills). Other analyses are more on the facility/chemical level. This includes looking at dioxins, PBTs, and other chemicals of interest (such as the top 15 RSEI chemicals). For dioxins: follow-ups are needed for any differences between amounts listed on the Form R and the Schedule 1 (which is a more detailed form just for dioxins), and if there are any issues with the congener distributions/proportions listed on the Schedule 1. At the facility level:
    - Note if any facility reports the exact same precise quantities listed 3 years in a row.
    - Note if any facility has a large difference between the sum of all releases for a chemical and the reported maximum quantity on-site.
    - Note if any facility has a large production/activity ratio (current year to previous year) --although with certain possible error messages in the TRI-MEweb reporting software, this DQ check may not be as necessary in the future.

a. If you send out a list, what is the criteria for the facility to be on the list?

- The national TRI program's NEI/TRI list consisted of facilities who: did not report to TRI but were included in NEI; or had TRI emission rates that were significantly different than NEI.
- NATA priority facilities. Mercury differences are handled [within the NEI program].
- Not applicable.
- [The TRI program] gets input from regions on any specific issues to focus on for their region (e.g., an industry sector), but mostly determines which facilities to call and sends those to the regions. Criteria include all the focuses listed above, and it's up to the regions to decide how many they call. It's mandatory to *resolve* 650 facilities annually for the TRI program.

b. Does the same procedure happen each time you do the QA process?

- The 2018 QA calls were the first national calls associated with comparing NEI and TRI. It's not clear if NEI/TRI comparisons will be done in future years.
- The QA process for NATA (which led to an updated version of the NEI) did not involve comparing NEI to TRI, but rather following up with state on priority facilities. We changed process /lists for priority facilities during NATA – criteria changed to reduce number or priority facilities.
- Not applicable.

6. What do you do when you see a difference?

- If a very large difference is noted and it suggests that the S/L value that we would otherwise be using in the NEI is obviously wrong, we exclude that S/L value from use in the NEI.
- We contact the company with an email, and follow-up call (if they don't respond).
- TRI and emissions data are different measurements. It would be expected there are differences.

7. If you see differences in data, how do you determine which is right? Do you follow up with the facility, follow up with the other program, change your data (not in TRI but is possible in NEI, e.g., mercury from gold mines)?

- If the magnitude is significant enough, I may contact the S/L and ask them to confirm their submitted data.
- Since NEI data is submitted by the State, and TRI is submitted by the company, we first ask the company if they feel that their TRI emission calculations are incorrect. If they believe they are incorrect, we encourage them to revise and update their TRI form in TRI-MEweb. If they believe that their TRI calculation is correct, and the State's NEI submission is wrong, we encourage them to reach out to their State permitting contact to determine if the NEI submission was accurate.
- For mercury, I [NEI program] change my data.
- If there was a concern regarding emissions data differences from TRI and another program, such as air, we would talk internally to our air program regarding this first.

8. What is the timing and how long does your process take?

- The entire time from S/L data submittal to NEI release is 6 months.
- For the hundreds of calls Region 5 does each year, we take approximately 3 months to complete.
- Round 1 of the TRI DQ calls is July through October. Round 2 is usually January-end of February and coincides with the publication of the National Analysis.

a. Is the QA process a one-shot deal? What happens when a facility resubmits/changes data in TRI (or NEI)?

- The process is over at the end of 6 months, because the need is to deliver a timely reasonable representation of the emissions loading to the atmosphere, rather than a completely accurate data value for each data point.
- Don't follow up or track.
- We do not compare TRI and other emissions data in [the region].
- If a determination is made that the TRI data is inaccurate, we ask the company to amend their TRI form electronically in TRI-MEweb.

b. What is the deadline to make data changes to NEI and TRI?

- We try to set artificial intermediate deadlines for each facility before the TRI National Analysis is released publicly each year. The deadline for this year is in April 2018.
- Different depending on NEI schedule/NATA review approach.
- Not applicable.

- This is not my call, this is HQ's issue.
- NEI data changes must be completed by 18 months after the end of the reporting year, which is 6 months after the S/L initial reporting deadline.

c. Do you use 2014 data for other years? If yes, please briefly describe.

- No.
- We use 2014 NEI data to look for 2016 TRI non-reporters. The theory is that if they were emitting a pollutant in 2014 (according to NEI), they would continue to emit in subsequent years. We reach out to these potential non-reporters to determine if there was any change to their process, or if they shut down, between 2014 and 2016.
- Not applicable.

9. **Do you have a pollutant or facility watch list for use in your QA process? If yes what is it based on? Examples include: sectors that have had problems in the past, emissions threshold or risk, pollutant based on risk.**
    - I have a set of emission magnitudes for each pollutant that account for a large percentage of the pollutant's US total, and which does not produce so many flagged items as to overwhelm the S/L data submitters that we would ask to confirm.
    - We have not established a facility watch list yet.
    - Mercury.
    - Not applicable.
    - No QA on TRI data.
    - TRI looks at dioxins, PBTs, and other chemicals of interest (such as the top 15 RSEI chemicals). For dioxins: follow-ups are needed for any differences between amounts listed on the Form R and the Schedule 1 (which is a more detailed form just for dioxins), and if there are any issues with the congener distributions/proportions listed on the Schedule 1.

10. **Do you have any general thoughts on your QA process or potential improvements?**
    - No. if it were a QA process I might have some.
    - Many facilities have complained about the difficulty in accessing NEI data (see Item 3(e) above). Making NEI data more accessible is critical to ensure that facilities understand the emissions rates that their State Agencies have submitted to NEI for them.
    - It isn't clear the folks doing this think it is worthwhile. What would make it so? What additional effort would be needed? This is not a QA process change but would impact the QA process: NEI needs to change business rules to use more TRI data if SLT reporting is not complete (the assumption that if the pollutant is reported anywhere at the facility means it is complete is flawed).
    - After the most recent 2018 Ad hoc data quality review of 2014 NEI and 2014 TRI reporting facilities, it did not seem clear as to why we're asking facilities to confirm their 2014 TRI reporting in comparison to 2014 NEI, as facilities do not report to NEI. Facilities that responded to the Agency questioned where the NEI numbers originated. Although we were informed that where the information was reported from to the NEI (for example, state environmental departments), there was not further context as to how the

NEI data was calculated. The [regional] TRI Program inquired with the TRI Data Quality Branch as to what information the Agency was seeking from facilities. It was not clear what the goal of the NEI and TRI comparison was. We also lacked the information to successfully inform facilities as to how the NEI numbers were generated.

Attachment 2: TRI and Texas Point Source Emissions Inventory TCEQ Data (provided by TCEQ staff)

This document is for informational purposes only to provide a general overview on the Toxics Release Inventory and Texas Point Source Emissions Inventory programs. This document is not intended to supersede or replace any state or federal law, rule, or regulation.

Toxics Release Inventory and Texas Point Source Emissions Inventory Comparison

Applicability

The TRI and EI programs have unique purposes and tailored reporting requirements (defined in federal and state statue and regulations) to enable the programs to meet their objectives. These two programs will have some common reported sites and emissions and comparing data between the two can help identify potential misreported emissions data; however, caution must be used when making these comparisons because there are inherent differences between the two programs.

For the TCEQ point source emissions inventory (EI), reporting applicability for sites is defined in 30 Texas Administrative Code Section (TAC) 101.10. In general, major stationary sources of air emissions are required to submit an annual emissions inventory.

For the Toxics Release Inventory (TRI), manufacturing, process, or otherwise used (MPO) release thresholds must be exceeded of a listed TRI chemical to require a site to report the chemical. In addition to the MPO thresholds, facilities must also have more than 10 employees and be classified as certain business types (primarily manufacturing) to be required to report to TRI. EI does not have these types of criteria for reporting.

Reporting Requirements

The Toxics Release Inventory compiles data for releases and waste management of 594 individually-listed chemicals and 31 chemical categories for all media (air, water, land, underground injection) releases. The TCEQ point source emissions inventory requires reporting of regulated air pollutants per the requirements of 30 TAC 101.10 by all sites that are required to submit an EI.

Differences

As detailed above, there will be differences between the emissions reported to EI versus releases in TRI due to differences in reporting thresholds, definitions, amounts or chemical classifications between the two programs. Other potential reasons for differences are outlined below.

1. Some chemicals on the TRI list have qualifiers which limit the reporting for those chemicals to specialized forms.

2. TRI includes reporting for chemical categories, compounds of various chemical structures that contain any element listed in part 3 of Table II of the TRI reporting package. Many of these categories are heavy metal compounds.
3. The required determination methods used to determine emissions could be different between EI and TRI.
4. TRI data includes releases due to spills, upsets, maintenance, or other one-time events. The EI contains annual routine emissions as well as emissions events and maintenance, start-up, and shutdown emissions as defined in state rule (30 TAC 101.201 and 30 TAC 101.211).
5. TRI has a de minimis exemption for each TRI chemical based on chemical percentage, whereas EI does not.
6. Point source EI reporting is required by all sites that meet any of the applicability thresholds in 30 TAC 101.10, regardless of industry type (one example is oil and gas sites). Additionally, a TRI applicable site may not be subject to EI reporting.

APPENDIX G: Recommendations for the CAER Common Emissions Form

CAER NEI/TRI/SLT EI
Guidance/Recommendations for the CAER Common Emissions Form

Background

At the CAER "Quick Start" workshop in September 2016, a small group of EPA and State members explored the idea of using a common emissions form (CEF) for sharing emissions data. Our team brainstormed various scenarios for the workflow of the CEF and its interaction with TRI and SLT EI/NEI data. The scenarios are based on the workflows developed through the September 2016 workshop and follow-up discussions from the CAER Product Design Team (PDT) and the Data Model R&D team and may evolve over time. In practice, several workflows could co-exist. In all scenarios, the CEF is used to share and distribute data to other EPA programs.

The requirements of the CEF to accomplish the data sharing across programs may be different for different scenarios. Our team focused on the requirements needed for facilities to meet TRI reporting for air releases. We developed guidance/recommendations for the form for a set of scenarios in which the form is used to pass air emissions data to the TRI program.

Table 1 outlines the scenarios. The sections following lay out more details and recommendations on the technical application of the CEF in relation to the NEI/SLT and TRI databases, including the CEF's user interface, TRI data elements to populate, considerations for specific pollutants, and back-end functionality.

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Workflow scenarios that could implement the CEF

The following possible scenarios for implementing the CEF differ based on CEF interactions with NEI, SLT EIs, and TRI and the direction of data flow.

SCENARIO	Workflow	Role of TRI	Role of Reporter/Facility	CEF benefits	CEF functional requirements
1	Existing SLT interface and back-end are retained; **CEF only receives data from SLT system**. SLTs QA data and approve submissions in their own system.	CEF receives data from TRI	Reporter separately fills out SLT and TRI and does not interact with CEF.	• Allows EPA automated QA of SLT and TRI data • Can send NEI either, both or the difference of calculated emissions (where TRI > SLT)	• Must be able to obtain data from SLTs and TRI • Must be able to incorporate (reformat, etc.) TRI data with SLT data to NEI
2a	Existing SLT interface and back-end are retained; **SLT interface obtains data from CEF**. SLTs QA data in CEF but approve submissions and collect fees in their own interface.	CEF receives data from TRI	Reporter uses CEF to report/edit emissions for SLT EIs and add apportionment information to the TRI data (voluntarily) but no changes in TRI emission amounts.	• Helps reconcile data which can go back into SLT database • Can send reconciled data to NEI • NEI and SLT get data at same time	• Must be able to obtain data from SLTs and TRI • Must have interface for reporter for SLT EI • Must be able to incorporate (reformat, etc.) TRI data with SLT data to NEI
2b	Existing SLT interface and back-end are retained; **SLT interface obtains data from CEF**. SLTs QA data in CEF but approve submissions and collect fees in their own interface.	CEF data transferred to TRI	Reporter uses CEF to report/edit emissions for both SLTs and TRI. Emissions required only by TRI could be reported at more detailed level or sum of non-SLT-reported processes for common (SLT/TRI) pollutants. TRI-only pollutants can be reported at facility level.	• Helps facility do calculations • Ensures better consistency • Can send data to TRI and NEI	• Must have interface for reporter for SLT EI &TRI • Must be able to incorporate (reformat, etc.) TRI data with SLT data to NEI • Must be able to push data to TRI
3	CEF replaces SLT interface but an SLT database is retained; **SLT database obtains data from CEF**. SLTs QA data and approve submissions in CEF and collect fees using CEF.	CEF data transferred to TRI	Reporter uses CEF to report/edit emissions for both SLTs and TRI. Emissions required only by TRI could be reported at more detailed level or sum of non-SLT-reported processes for common (SLT/TRI) pollutants. TRI-only pollutants can be reported at facility level.	• Helps facility do calculations • Ensures better consistency • More efficient reporting • Can send data to SLT, TRI, and NEI at the same time	• Must have interface for reporter for SLT EI &TRI • Must be able to push data to SLT databases and TRI • Must be able to incorporate (reformat, etc.) TRI data with SLT data to NEI • Must address SLT fees and approval
4	**SLT uses CEF directly** to collect, QA, and approve data from facility users.	CEF data transferred to TRI	Reporter uses CEF to report/edit emissions for both SLTs and TRI. TRI only emissions could be at more detailed level or sum of non-SLT-reported processes for common (SLT/TRI) pollutants. TRI-only pollutants can be reported at facility level.	• Same as above, plus less maintenance	• Same as above, but does not need to push data to SLT database

After discussion within the CAER PDT, we chose to focus on the workflows in which the CEF is populated and used first. Below are the recommendations for scenarios 3 and 4, for which both SLT EIs and TRI receive emissions data from the CEF.

Scenarios 3 and 4: CEF gets data from facility reporter

Figure 1 shows the workflows required to implement Scenarios 3 or 4, including what the reporter/facility must do and what the CEF's capabilities are. More details on what is needed by the form are below.

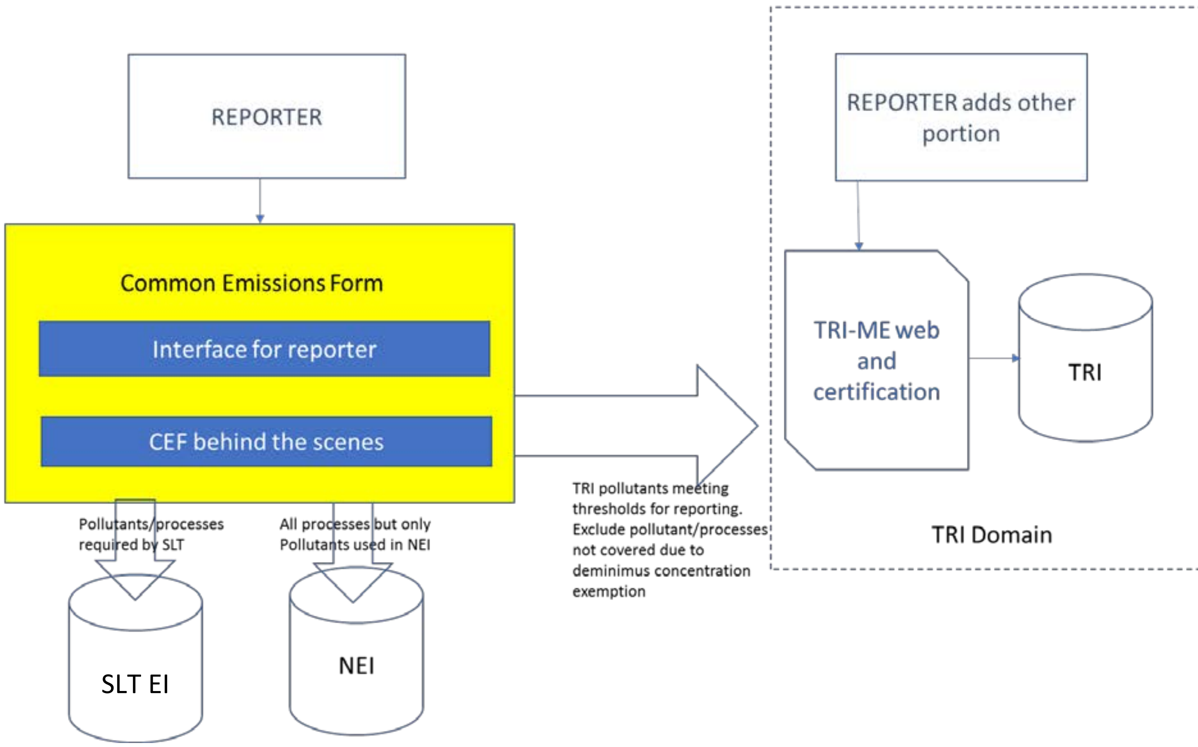

Figure 3. The overall workflow of the CEF under scenarios 3 & 4. In both cases, the CEF is populated by the facility reporter and is then used to populate data for SLT EIs, NEI, and TRI forms. It is assumed that the data collected by SLT would be the same as the data needed for the NEI. Under scenario 3, SLT databases will receive data from the CEF, while under scenario 4, SLTs will interact with the CEF directly.

Within these scenarios, each facility may have different reporting needs. These include circumstances in which:

- Facility is only subject to TRI
- Facility is only subject to SLT/NEI
- Facility is subject to both SLT/NEI for all pollutants and all processes
- Facility is subject to both but some pollutants or processes are not required by one or the other program

The following recommendations focus on the situation in which the facility is subject to both SLT/NEI and TRI, and reports data to the CEF for both programs.

CAER Form Interface

To implement the CEF under Scenario 3 or 4, the team developed the following considerations and recommendations for the CEF's user interface:

- The CEF flags the pollutants covered by each program (SLT/NEI, TRI). Flag should distinguish between pollutants that exactly match vs overlap pollutants that don't exactly match (can use the TRI NEI Pollutant Crosswalk developed by this team in Phase 1). For pollutants which are reported in groups, the CEF shows the name of the group in addition to the name (choose across programs) of the pollutant. Names should be searchable based on any synonym of the pollutant that is in the Substance Registry System.
- Include a "code finder" on the form that provides the reporter guidance to use based on a set of questions/key words. This may be limited to control codes emission calculation method codes (SCC).
- Any code (SCC or otherwise) that includes "other" as a category should provide a write-in option for the facility to explain what "other" means.
- The CEF would enable the reporter to flag each emission record (process-pollutant) to identify whether the emissions are subject to report to SLT and TRI, respectively. This is a field the user will select. To do so:
    - The CEF should include tools to help user figure out reporting thresholds for SLT and TRI to assist reporting in making the determination
    - The CEF would need regulatory/reporting disclaimers on the selection window, so the users acknowledge they know the reporting programs' requirements are different and that they are ultimately responsible for entering accurate information to each program based on respective requirements.
    - The form should allow the user to specify whether a process is exempt from TRI in the case where a concentration of pollutant is below the de minimis level.
    - The form should display the controls/waste treatment codes for each process. Both SLT control codes and their associated TRI waste treatment code should be displayed.
    - Provide the structure for facilities to report the emissions for any processes that may be missing from the facility configuration such as non-permitted processes that need to be included in TRI but not necessarily the SLT EI. For example, Minnesota created one dummy emission unit, EU000, for non-permitted emissions for air toxics. The emission unit could have multiple processes to represent emissions from additional TRI processes.
    - Provide a drop down to indicate whether emissions are routine or non-routine/accidental.
- Show (or make accessible) the amount of emissions, by process and pollutant, that will be used for TRI stack and TRI fugitive processes
    - One option is to also show (or make accessible) more detailed release point information.
- Provide a calculation method code field (drop down menu with text field for comments) for each pollutant/process. If the CAER Emissions Factor Compendium is used, the CEF should figure out what the calculation method code is, based on information from Emissions Factor Compendium. The calculation method code field should show how the SLT code is mapped to TRI.
- Provide a control code field for each pollutant/process. This would also be a dropdown menu.

- The CEF could include links to the latest guidance for computing emissions. Education, programmatic outreach, and technical guidance are necessary for reporting facilities and would improve their ability to provide better representative emissions data for both SLT EIs and TRI.
- The form should include up to date emission factors. For example, the Electric Power Research Institute (EPRI) and the National Council for Air and Stream Improvement (NCASI) frequently update emission factors for electric generating processes and pulp & paper, respectively. There should be a routine effort to update the national emission factor repository with emission factors from EPRI, NCASI, and other sources.

Populating TRI Emissions Data Elements for the CEF

The below table summarizes the emissions-related data elements needed to support reporting air releases. Facility identification fields such as NAICS codes, address, contact information, are not covered by this table. The only non-emissions related field covered in this table are the waste treatment codes.

TRI data element	Field length OR conforms to …	Description	How Populated/Comments
TRIFID	Conforms to FRS 15 characters n length	identifies the facility in all public dissemination and is also used to identify TRI Facilities internally	Identify the proper TRIFID for each process. This is needed because facility definitions could be different between different data systems (i.e., SLT EI and TRI).
MULTI_ESTABLISHMENT_NAME	60 characters in length	TRI Multi-Establishment or "Part" name of the facility	Identify the proper multi-establishment for each process. This is needed because facility definitions could be different between different data systems (i.e., SLT EI and TRI)
CAS No./Chemical ID no.	Conforms to SRS	Pollutant identifier	Mapped from EIS pollutant code. For TRI chemical categories, the TRI category no. would be populated.
Chemical Name	Conforms to SRS	Name of pollutant	Mapped from CAS No./Chemical ID no.
Fugitive Release (lbs) (grams for dioxins)	Number	Quantity of air emissions released as fugitives	Sum of releases of all TRIFID-labeled processes that are apportioned to fugitive (EIS release point type = 1) release points
Stack Release (lbs) (grams for dioxins)	Number	Quantity of air emissions released to stack	Sum of releases of all TRIFID-labeled processes that are apportioned to stack release points (EIS release point type not equal 1)
Fugitive Release, basis of estimate	Alphanumeric code (current values are: M1, M2, E1, E2, C, O)	Code describing the approach for estimating the emissions released as fugitives	Map from EIS emission calculation method code using code crosswalk (Appendix D); if multiple values, use the value with largest fugitive emissions
Stack Release, basis of estimate	Same as above	Code describing the approach for estimating the stack releases	Same as above, if multiple values, use the value with largest stack emissions

General Waste Stream	1-character code	Waste stream type code	For all from EIS: Waste stream = A
Waste stream identifier *	Integer	Not a TRI data element but would be needed to identify each air waste stream to which treatment codes apply (since there could be multiple air streams at one facility for purposes of treatment code reporting)	This was not fully fleshed out, but a possibility is that the form's interface would allow a reporter to identify processes that share common waste streams, so that the air streams are numbered. This would enable the all waste treatment-related fields to be properly populated.
Waste Treatment Method Sequence	Integer	Order in which the waste treatment method is applied to a waste stream (e.g., scrubber might be first)	Mapped from EIS emission control code(s). Applies to entire facility, Not separate value for stack/fug. These should be listed in the order that they are applied. Facility reporter needs to put the treatment codes in sequence and the form translates that into TRI. As a starting point, the TRI waste treatment codes can be added to Synaptica to store the data. (Confer with TRI program for this).
Waste Treatment Efficiency Code	Alphanumeric code that represents a range of efficiency. Current values: E1, E2, E3, E4, E5, E6.	Treatment/reduction efficiency range for the waste stream; % that shows how much of that specific pollutant was treated/removed from the stream	Mapped from EIS emission reduction efficiencies for the overall waste stream, not the individual treatment process. Aggregates efficiency for all processes for treating the chemical in the air waste stream. Consider weighted (by uncontrolled emissions) approach to aggregate different efficiencies. Applies to entire facility, not separate value for stack/fug. This is pollutant specific.
Treatment codes	Alphanumeric code, comma separated. Current values are: A01, A02, A03, A04, A05, A06, A07, H040, H071, H073, H075, H076, H077, H081, H082, H083, H101, H103, H111, H112, H121, H122, H123, H124, H129	Code describing the approach used by the facility for treating the air emissions to reduce their release quantity (if applicable). This is NOT pollutant specific but applies to the whole air stream.	Map from EIS emission control codes using code crosswalk (Appendix D), Applies to entire facility, Not separate value for stack/fug. As a starting point, the TRI waste treatment codes can be added to Synaptica to store the data. (Confer with TRI program for this).

*This element has not been not fully fleshed out and may need further discussion.

Specific Pollutant Considerations

Although there is significant overlap in the pollutant/chemical lists covered by the NEI/SLT EI and TRI programs, there are some differences. Further, there are some instances in which a pollutant/chemical is covered by all programs, but is defined or categorized differently by the different reporting regulations. For these identified pollutants, the CEF will need to take additional steps to ensure the users are reporting the appropriate forms and quantities of these pollutants to each program:

- Clearly define pollutants that belong to groups in the form and indicate where certain pollutants are included/excluded for overlapping groups across programs.
  - For cyanide compounds, CN should be clearly defined as excluding hydrogen cyanide (HCN), and HCN should be clearly defined as only HCN. The CEF should state that CN cannot include HCN and that HCN must be reported separately from cyanide compounds to determine the TRI reporting requirements for this chemical. Some states, such as Oklahoma, allow reporters to report only total CN, which may need to be addressed carefully through guidance. Possibly the form would need to sum CN and HCN together if the state does not delineate these two pollutants. In this situation, the pollutant should be clearly labeled as the sum of CN and HCN.
  - For glycol ethers, the CEF should have two glycol ether pollutant groups: 1) glycol ethers without ethylene glycol monobutyl ether (EGBE, chemical abstracts service number 111-76-2) and 2) ethylene glycol monobutyl ether (EGBE, chemical abstracts service number 111-76-2). TRI certain glycol ethers will be the sum of these two.
- Naphthalene should not be summed into any PAH group, but should be reported individually as naphthalene. (This would require WebFire to be updated because naphthalene is incorporated into emission factors for polycyclic aromatic compounds for some SCCs).
- Listing out individual PAHs on the form even though TRI sums the 25 individual compounds that comprise PAC compounds to PAC (N590).

Back-end Calculations and Functions

Under any of the workflow scenarios, the CEF will need to have these built-in functionalities:

- Ensure the proper pollutants go to each system. In some situations, pollutants in the CEF may be reported for pollutants common across systems but with different pollutant universes or where factors need to be applied to convert one pollutant to another (e.g., the form converts cobalt oxide emissions required by SLT to cobalt emissions required by NEI). The CEF should do that conversion.
- Include procedures for computing emissions that may be more complex than just using emission factors, such as MDI/TDI reporting from the polyurethane industry (https://polyurethane.americanchemistry.com/rcap/) or HAP metals from spray coating operations (approach developed by EPA/OAQPS/SPPD).
- Send only emissions flagged as SLT to the SLT database (send to EIS if no state database), at same level of detail as the CEF. Sum those flagged to TRI by pollutant-fugitive and pollutant-stack by facility or facility/establishment.
- Map emission calculation method codes for each pollutant/process/release point to a pollutant-specific fugitive TRI basis of estimate code and a pollutant-specific stack TRI basis of estimate codes. If there is more than one basis of estimate code, use the one with the greatest amount of emissions released.
- Map control code for each process-pollutant-release point to a treatment code using the crosswalk in Appendix 4 of the final report. These codes and the crosswalk can be stored/managed in Synaptica. Aggregate treatment code by pollutant.

- Ensure form has all TRI-ME web quality assurance features built into it for air releases reporting.
- Compute fees to SLT programs as applicable.

Other Features

- Enable the reporter to see the submitted data for their reference as they complete the CEF.
- Potentially, the CEF reporting software could pull facility-reported data from the most recent TRI submission (when applicable) to show the user a comparison to the facility's aggregated CEF emissions (i.e., categorized as stack and fugitive).
    - The CEF could also potentially allow the facility to select prior year's data to pre-populate the current CEF, and/or to select a percentage of the prior data to be reported as emissions for the emissions data elements.