



Lean, Radically Simple Emission Inventories

- LEAN and Continuous Improvement
- Kaizen process
- Point Source Els
- Area Source Els





LEAN & CONTINUOUS IMPROVEMENT

- ADEQ's mission: To protect and enhance public health and the environment of Arizona
- ADEQ seeks to accomplish mission through two guiding ideals:
 1. Our "True North" – what we want our organization to be
 2. The "ADEQ Way" – 10 behaviors that guide our daily work
- ADEQ Lean Management System (ALMS) - Adoption of lean management techniques into a coherent management system

- Each employee receives >40 hours of training on the management system and lean principles
- ADEQ's Office of Continuous Improvement develops and delivers training and provides staff coaching
- ADEQ culture empowers employees to look for improvement opportunities to reduce waste and increase productivity

To be the number one state in the nation in:

- Balanced, leading-edge environmental protection,
- Technical and operational excellence, and
- Radical simplicity for customers and staff

ADEQWAY

- Evaluate everything we do for its impact on the mission
- Hire only those who believe in our way and have a passion for their work
- Train those who cannot, replace those who will not, and promote those who excel
- Never hide a problem – respect others enough to be honest, even if the truth is uncomfortable
- Do not blame, but hold each other accountable
- Involve end users early and often when creating or improving services
- Never stop asking why
- Continuously design and redesign for quality and radical simplicity
- Freely discuss, promptly decide, and totally commit
- Do not fear failure



KAIZEN PROCESS

- The Kaizen management theory uses continuous and incremental improvement in a process to create compounded improvements in productivity while humanizing the workplace and reducing workplace complexity.
- The philosophy uses a methodical process of “Plan, Do, Check, Act” that involves all members of the organization, and external stakeholders when necessary, to simplify and improve the quality of a product.

- The first ADEQ SIP Kaizen event in 2013 resulted in 13 formal recommendations. Every person on the SIP team had some involvement in the implementation of these recommendations
- The goal for the 2013 Kaizen event
 - Nonattainment Area (NA) State Implementation Plans (SIP) being delivered to the EPA by the federally prescribed deadline
 - Reduction in the re-writes of SIPS
 - Reduction in total time spent developing a SIP

- ADEQ held multiple Kaizen events focused on SIP process
 - 2013 Goals
 - Standardize work and apply project deliverables to future SIPs to improve quality and consistency of product
 - Produce SIPs that pass internal ADEQ and external EPA review and approval process
 - Maintain collaborative work environment; improving group cohesion as secondary outcome
 - Complete all project tasks and meet all milestones
 - 2016 Goals
 - Root cause analysis of bottlenecks and waste
 - Identify process improvement projects
 - Review and update upon previous Kaizen products

- Emission Inventory Improvements
 - Templates for EI and Modeling SIP chapters
 - Inventory Preparation Plan template
 - Statewide Area Source EI
 - Excel-based project manager utility
 - Standard file structure and nomenclature
 - IPP and EI template generator
 - QA/QC and Close-Out checklists





POINT SOURCE EMISSION INVENTORIES

- **Minor Source**
 - Previous collection method (9 page Excel/PDF)
 - Current collection method (3 page Excel/PDF)
 - Future collection method (myDEQ)

- **Major Source**
 - SLEIS
 - SLEIS enhancement project



- Notification letter mailed to permittees (~400 facilities)
- Two reporting mechanisms depending on permit classification:
 - Major Sources → online (SLEIS)
 - Minor Sources → manual (Excel or PDF)
- Minor Source downloads form (Excel or PDF), fills out, prints, mails to ADEQ
- ADEQ receives, reviews, and manually enters emission totals in local Access database

Reporting Form (Excel)

ADEQ		FORM 2.1 - GENERATORS & BOILERS				2016	
ANNUAL EMISSIONS INVENTORY QUESTIONNAIRE - Version 1.4		FACILITY NAME		PLAGEID#	PERMIT# or LTF#		
Example Facility				1234	56789		
EQUIPMENT INFORMATION							
GENERATORS	Equipment Description	Equipment ID	ATO#	Fuel Type	Max. Capacity (HP)	Actual Hours Operated	
#1							
#2							
#3							
#4							
#5							
#6							
#7							
#8							
#9							
#10							
#11							
#12							
#13							
#14							
#15							
BOILERS	Equipment Description	Equipment ID	ATO#	Fuel Type	Rated Capacity (MMBtu/hr)	Actual Hours Operated	
#1							
#2							
#3							
#4							
#5							
#6							
#7							
#8							
#9							
#10							
#11							
#12							
#13							
#14							
#15							

FORM 2.1 EMISSION SUMMARY (TONS PER YEAR)								
PM ₁₀	PM _{2.5}	NO _x	SO _x	VOC	CO	HAPs	LEAD	NH ₃
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Emission Factor Appendix

Arizona Department of Environmental Quality
Annual Emission Inventory Questionnaire Emission Factors

FORM 2.1 - GENERATORS & BOILERS

Generators

Source: ADEQ's HMAP Application Emission Calculation Spreadsheet

(<http://azdeq.gov/function/forms/download/HMA%20application%20emission%20calculations1.xlsx>) & AP-42 Chapter 3.3 (<http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf>)

Emissions from generators are based on three factors: 1) The generator's maximum capacity expressed as horsepower, 2) the number of hours the generator was operated, and 3) a fuel-specific emission factor. The fuel-specific emission factors are provided in Tables 1. The emission factors for gasoline were taken from AP-42 Chapter 3.3, Table 3.3-1. All other emission factors were taken from ADEQ's HMAP Application Emission Calculation Spreadsheet.

Table 1: Generator Emission Factors

Pollutants	DIESEL - LESS THAN OR EQUAL TO 600 HP	DIESEL - GREATER THAN 600 HP	NATURAL GAS	GASOLINE
	pounds/hp-hour	pounds/hp-hour	pounds/hp-hour	pounds/hp-hour
PM ₁₀	0.0022	0.0007	0.00000054	0.000721
PM _{2.5}	0.0022	0.0007	0.00000054	0.000721
NO _x	0.0310	0.0240	0.02220	0.011
SO _x	0.0000121	0.0000121	0.0000041	0.000591
VOC	0.00247	0.000705	0.000826	0.015
CO	0.00668	0.0055	0.000826	0.00696

The standard form of the calculation for generator emissions is:

$$\text{Emissions (tons)} = \text{Maximum Capacity (HP)} \times \text{Operational Hours (hrs)} \times \text{Emission Factor (lbs/HP-hr)} / 2000 \text{ (lbs/ton)}$$

Example Calculation

A 500 horsepower diesel generator was operated for 50 hours in 2014. What were the PM₁₀ emissions for this year?

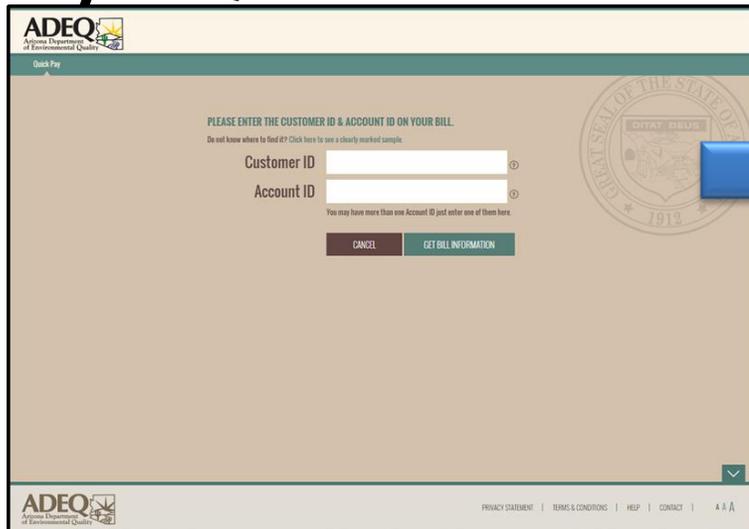
$$\text{PM}_{10} \text{ Emissions} = 500 \text{ (HP)} \times 50 \text{ (hours)} \times 0.0022 \text{ (emission factor from Table 1)} / 2000$$

$$\text{PM}_{10} \text{ Emissions} = 0.0275 \text{ tons}$$

- **RCRA EPA ID No.** — Digitally file EPA Form 8700-12 or modify/deactivate/reactivate EPA ID for hazardous waste generation
- **Water Quality Self Monitoring Reporting Forms (SMRF)** — Digitally submit SMRF data
- **Electronic Discharge Monitoring Report (e-DMR)** — Digitally submit your DMR data
- **Crushing & Screening (C & S), Concrete Batch Plant (CBP) and Hot Mix Asphalt Plant (HMAP) General Permit** — Apply for and manage Permits online
- **QuickPay** — Pay ADEQ bills online
- **Underground Storage Tank (UST) Preapproval**

- myDEQ will serve as one-stop-shop for all agency business
- Facilities can apply for permit, submit compliance reports, and submit annual emission reports
- myDEQ will interface with SLEIS, ADEQ's major source reporting application

myDEQ



ADEQ Arizona Department of Environmental Quality

Quick Pay

PLEASE ENTER THE CUSTOMER ID & ACCOUNT ID ON YOUR BILL.

Do not know where to find it? Click here to see a clearly marked sample.

Customer ID

Account ID

You may have more than one Account ID just enter one of them here.

ADEQ Arizona Department of Environmental Quality

PRIVACY STATEMENT | TERMS & CONDITIONS | HELP | CONTACT | A A A

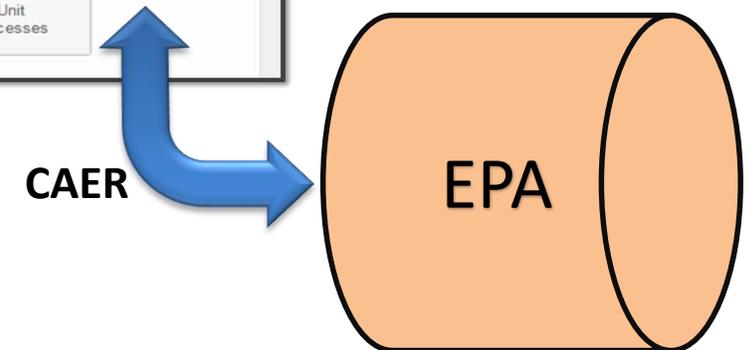
SLEIS



2014 Emissions Report In Process

Facility Inventory

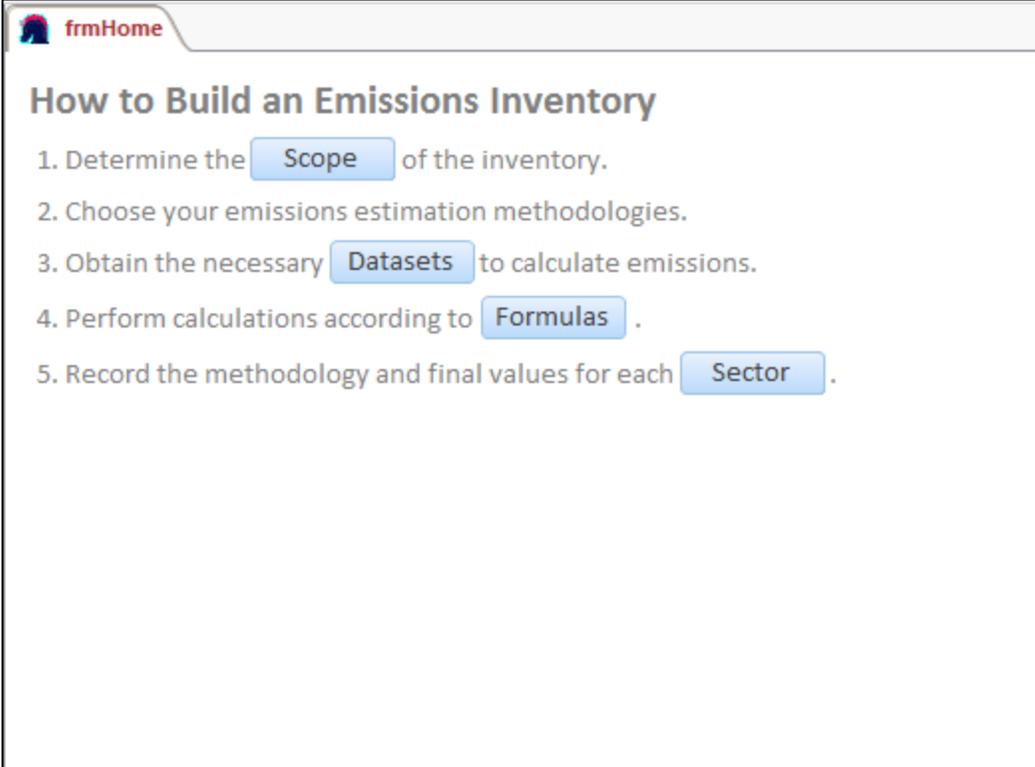
 Facility	 Release Points	 Control Devices	 Emission Units	 Unit Processes
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AREA SOURCE EMISSION INVENTORIES

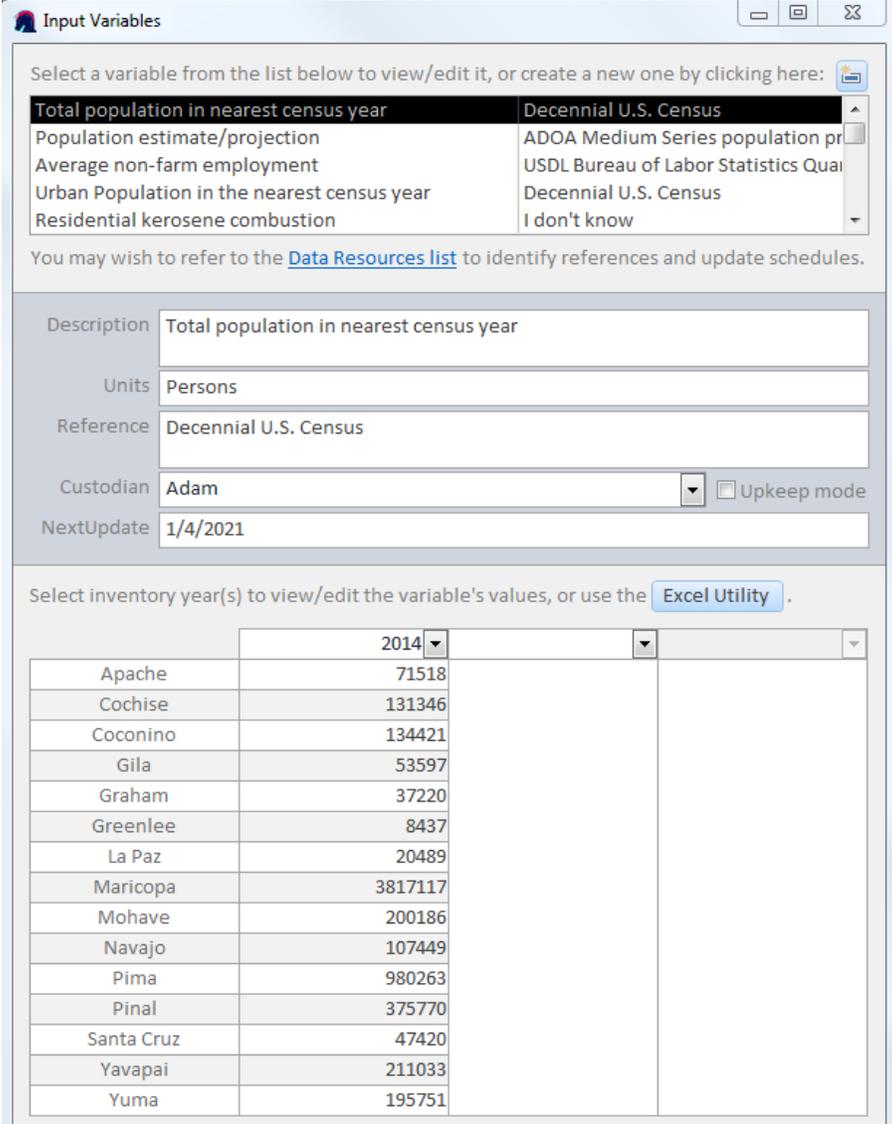
- Access-based application developed by ADEQ EI staff
- Database to store datasets, formulas, reviews, and emissions data
- UI with various utilities streamlines data-entry and reduces duplicative work



The screenshot shows a web browser window with a tab labeled 'frmHome'. The main content is a guide titled 'How to Build an Emissions Inventory' with five numbered steps:

1. Determine the **Scope** of the inventory.
2. Choose your emissions estimation methodologies.
3. Obtain the necessary **Datasets** to calculate emissions.
4. Perform calculations according to **Formulas**.
5. Record the methodology and final values for each **Sector**.

- Scope
 - Define temporal and spatial scope of inventory
- Datasets
 - Define, store, and re-use datasets such as population or employment



Select a variable from the list below to view/edit it, or create a new one by clicking here:

Total population in nearest census year	Decennial U.S. Census
Population estimate/projection	ADOA Medium Series population pr
Average non-farm employment	USDL Bureau of Labor Statistics Qua
Urban Population in the nearest census year	Decennial U.S. Census
Residential kerosene combustion	I don't know

You may wish to refer to the [Data Resources list](#) to identify references and update schedules.

Description: Total population in nearest census year

Units: Persons

Reference: Decennial U.S. Census

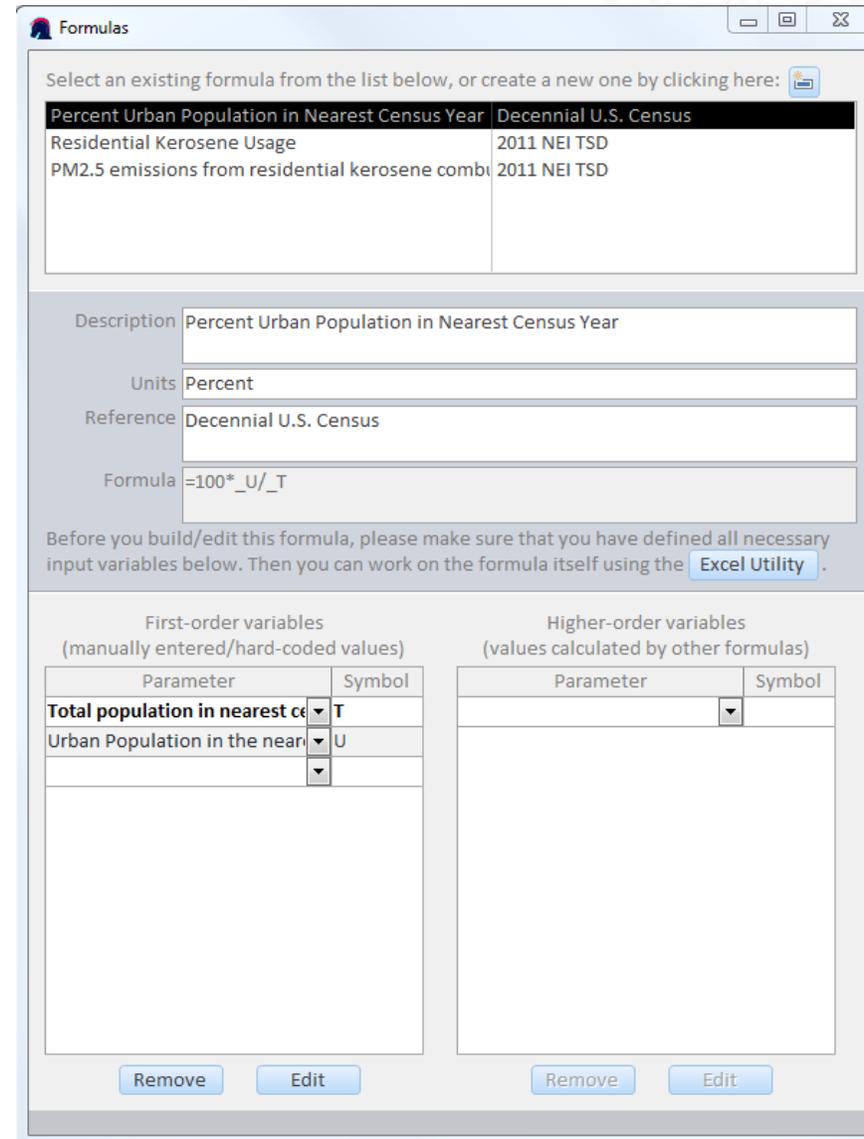
Custodian: Adam Upkeep mode

NextUpdate: 1/4/2021

Select inventory year(s) to view/edit the variable's values, or use the [Excel Utility](#).

	2014		
Apache	71518		
Cochise	131346		
Coconino	134421		
Gila	53597		
Graham	37220		
Greenlee	8437		
La Paz	20489		
Maricopa	3817117		
Mohave	200186		
Navajo	107449		
Pima	980263		
Pinal	375770		
Santa Cruz	47420		
Yavapai	211033		
Yuma	195751		

- Formulas
 - Define and reuse formulas



Select an existing formula from the list below, or create a new one by clicking here:

Percent Urban Population in Nearest Census Year	Decennial U.S. Census
Residential Kerosene Usage	2011 NEI TSD
PM2.5 emissions from residential kerosene comb	2011 NEI TSD

Description: Percent Urban Population in Nearest Census Year

Units: Percent

Reference: Decennial U.S. Census

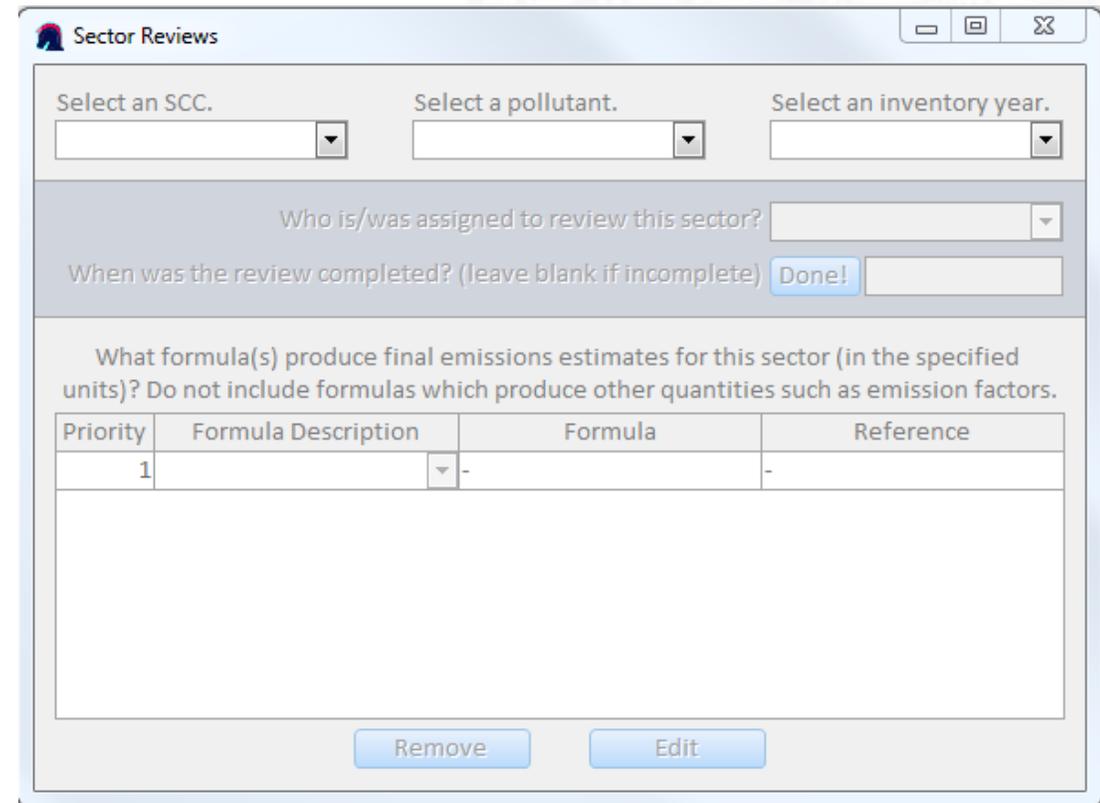
Formula: $=100 * _U / _T$

Before you build/edit this formula, please make sure that you have defined all necessary input variables below. Then you can work on the formula itself using the [Excel Utility](#).

First-order variables (manually entered/hard-coded values)		Higher-order variables (values calculated by other formulas)	
Parameter	Symbol	Parameter	Symbol
Total population in nearest ce	T		
Urban Population in the near	U		

Buttons: Remove, Edit (for both tables)

- Sector Review
 - Track reviews and define emission calculation priority



The screenshot shows a software window titled "Sector Reviews". At the top, there are three dropdown menus: "Select an SCC.", "Select a pollutant.", and "Select an inventory year.". Below these is a dropdown menu for "Who is/was assigned to review this sector?". A text field for "When was the review completed? (leave blank if incomplete)" is followed by a blue "Done!" button. The main section contains a text prompt: "What formula(s) produce final emissions estimates for this sector (in the specified units)? Do not include formulas which produce other quantities such as emission factors." Below this is a table with four columns: "Priority", "Formula Description", "Formula", and "Reference". The first row has "1" in the "Priority" column, a dropdown arrow in "Formula Description", and dashes in "Formula" and "Reference". At the bottom are "Remove" and "Edit" buttons.

Priority	Formula Description	Formula	Reference
1		-	-



FUTURE WORK

- Currently myDEQ allows certain facilities to:
 - Apply for and manage general air permits
 - Submit air annual compliance certification
 - Submit Water Quality Self Monitoring Reporting Forms (SMRF)
 - Pay fees
- Coming to myDEQ June 2017:
 - Get a fleet station permit
 - Get stormwater permit coverage
- SLEIS enhancements (E-Enterprise Grant)
 - Minor source emission inventories
 - Compliance reports
 - Connect to SCC web service (CAER)



- Collect emissions data through myDEQ for rock product facilities (crushing & screening, concrete batch & hot mix asphalt)
 - Will leverage data collected in compliance certification (throughput, hours of operation) to calculate emission totals
- Integrate SLEIS and myDEQ
 - Single log-in
- Additional SLEIS enhancements
 - Connections to future CAER web services

ADEQ has been deeply involved in E-Enterprise Combined Air Emissions Reporting project

- ***QA/QC***

- Identification and evaluation of a common set of emissions data QA/QC procedures for shared emission reporting.

- ***GHG Emissions Mapping Study***

- Pilot study to map emission data in the EPA's national Greenhouse Gas Reporting Rule (GHGRP) to example state greenhouse gas reporting program(s).

- ***TRI/NEI/SLT Program Crosswalk***

- Research consistency and possible workflows for sharing of emissions data between TRI, SLTs and NEI -- Phase 1

- ***Emissions Data Design***

- Establish and document a data model with basic core set of emissions-related data elements to support reporting through a common emissions form (CEF).

- ***SCC/Emission Factors***

- Scoping study for identifying problems and solutions with SCCs and WebFIRE that will meet SLT, NEI, NATA, and CEDRI/ERT requirements under the CAER project.

Questions?

Michael Burton

Burton.Michael@azdeq.gov

Mike Sonenberg

Sonenberg.mike@azdeq.gov

