

# Greenhouse Gas Inventory and Projection Tool for States

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# Overview

- Background
- Lessons Learned
- State Inventory Tool
- State Inventory Tool Demonstration
  - CO<sub>2</sub> from Fossil Fuel Combustion
  - Natural Gas and Oil
  - Synthesis Module
- Projection Tool



# Background

- The State and Local Program began in 1990
  - Mission: to build capacity in the states
- Developed the *State Guidance* for estimating state GHG emissions
- Gave grants to states to develop GHG inventories
  - 42 states and Puerto Rico have developed inventories





# Lessons Learned

- Inventories are time-intensive
  - Collecting the data
  - Identifying the correct emission factors
  - Setting up the infrastructure to calculate emissions
- Inventories for a single year in the 1990s are insufficient for mitigation planning in 2007
- Emission trends are necessary for projecting emissions, identifying mitigation activities, setting targets, and creating action plans



# Lessons Learned (cont.)

- Methods in 2003 EIIP Guidance are outdated
  - Creation of User's Guide to update methodology and provide guidance for modules
- States need tools
  - To facilitate updates
  - To project emissions
  - To analyze trends
  - To provide a standardized methodology
  - To track progress from year to year



# State Inventory Tool Goals

- Leverage EPA's extensive inventory experience
  - Development of the National Inventory
  - Contributing to the IPCC Good Practice Guidance
- Provide default state activity data and emission factors, but allow customization
- Maximize transparency
- Provide estimates through which the most recent year for which data are available
- Enable sector experts to work simultaneously on different parts of the inventory
- Utilize a user-friendly interface





# State Inventory Tool Design

- Eleven Excel® modules comprise the State Inventory Tool
  - Ten modules cover the emission source categories
  - One Synthesis Module compiles data from the source modules into a complete inventory



# Sector Modules


- CO<sub>2</sub> from Fossil Fuel Combustion
- CH<sub>4</sub> and N<sub>2</sub>O from Stationary Combustion
- CH<sub>4</sub> and N<sub>2</sub>O from Mobile Combustion
- Natural Gas and Oil Systems
- Coal Mining
- Industrial Processes
- Agriculture
- Municipal Solid Waste
- Wastewater
- Land-Use Change and Forestry





# Using the Tool

- Complete one module at a time or farm modules out to sector experts
- When modules are complete, create export files
- Use Synthesis Module to create summary tables and graphs



# Completing a Source Module...

- On the control worksheet: select the state, select the parameters of the inventory (where necessary), and fill in the emission factors
- On the calculation worksheet: enter data or select default data
- On the summary worksheet: view the summary of emissions
- On the control worksheet: export the summary data to a separate file

# Completing a Source Module: Control Worksheet

**State Inventory Tool - CO<sub>2</sub> Emissions from Combustion of Fossil Fuel**

File Edit Module Options

**State Inventory Tool - CO<sub>2</sub> Emissions from Combustion of Fossil Fuels**

1. Choose a State

This is very important - it selects the correct default variables for your state.

2. Fill In the Variables that are used throughout the module for:  
Either Type in the value/percentage or Click the Default Box

**Combustion Efficiencies**

Fuel	Default Efficiency	Efficiency Used	Use the Default? (Check for Yes)
Coal	100.0%	100.0%	<input checked="" type="checkbox"/>
Natural Gas	100.0%	100.0%	<input checked="" type="checkbox"/>
Petroleum	100.0%	100.0%	<input checked="" type="checkbox"/>
LPG	100.0%	100.0%	<input checked="" type="checkbox"/>

**Carbon Contents (lbs Carbon/million Btu)**

Fuel	Default Carbon Content	Carbon Content Used	Use the Default? (Check for Yes)
Asphalt and Road Oil	45.42	45.4	<input checked="" type="checkbox"/>
Aviation Gasoline	41.56	41.6	<input checked="" type="checkbox"/>
Distillate Fuel	43.94	43.9	<input checked="" type="checkbox"/>
Jet Fuel, Kerosene	variable by year	variable by year	<input checked="" type="checkbox"/>
Jet Fuel, Naphtha	43.50	43.5	<input checked="" type="checkbox"/>
Kerosene	43.44	43.4	<input checked="" type="checkbox"/>
LPG (industrial)	variable by year	variable by year	<input checked="" type="checkbox"/>
LPG (energy only)	variable by year	variable by year	<input checked="" type="checkbox"/>
Lubricants	44.58	44.6	<input checked="" type="checkbox"/>
Motor Gasoline	variable by year	variable by year	<input checked="" type="checkbox"/>
Residual Fuel	47.33	47.3	<input checked="" type="checkbox"/>
Misc. Petro Products	variable by year	variable by year	<input checked="" type="checkbox"/>
Feedstocks, Naphtha	39.96	40.0	<input checked="" type="checkbox"/>
Feedstocks, Other Oils	43.94	43.9	<input checked="" type="checkbox"/>
Pentanes Plus	40.18	40.2	<input checked="" type="checkbox"/>
Petroleum Coke	61.34	61.3	<input checked="" type="checkbox"/>
Still Gas	38.57	38.6	<input checked="" type="checkbox"/>
Special Naphthas	43.74	43.7	<input checked="" type="checkbox"/>
Unfinished Oils	variable by year	variable by year	<input checked="" type="checkbox"/>
Waxes	43.63	43.6	<input checked="" type="checkbox"/>
Residential Coal	variable by year	variable by year	<input checked="" type="checkbox"/>

Control / Residential / Commercial / Transportation / Electric Power / Bunker Fuels / Industrial / Summary-MMTCO<sub>2</sub>E / Summary



# Completing a Source Module: Calculation Worksheet

**State Inventory Tool - CO<sub>2</sub> Emissions from Combustion of Fossil Fuel**

File Edit Module Options Type a question for help

## 3. Residential Consumption and CO<sub>2</sub> Emissions in Colorado

Click here for possible data sources.

CO<sub>2</sub> emissions from fossil fuel combustion in the residential sector are calculated by multiplying energy consumption (in the residential sector) by carbon content coefficients for each fuel. These quantities are then multiplied by fuel-specific percentages of carbon oxidized during combustion ("combustion efficiency"). The resulting fuel emission values, in pounds of carbon, are then converted to short tons of carbon and million metric tons of carbon equivalent (MMTCE), then to million metric tons of carbon dioxide equivalent (MMTCO<sub>2</sub>E), and summed. For further detail on this method, refer to the CO<sub>2</sub>FFC Chapter in the User's Guide.

According to the methods developed by the International Panel on Climate Change, CO<sub>2</sub> emissions from the combustion of biogenic sources (e.g., fuel wood) are not counted in greenhouse gas inventories, provided that those sources are harvested on a sustainable basis. The carbon in wood fuel was originally removed from the atmosphere by photosynthesis, and under natural conditions, it would cycle back to the atmosphere eventually as CO<sub>2</sub> due to degradation processes. For processes with CO<sub>2</sub> emissions, if the emissions are from biogenic materials and the materials are grown on a sustainable basis, then those emissions are considered to close the loop in the natural carbon cycle.

Go to the Control Sheet

Check All Boxes

Clear All Data

### 1990 ☒ Default Consumption Data?

Fuel Type	Consumption (Billion Btu)	Emission Factor (lbs C/Million Btu)	Combustion Efficiency (%)	Emissions (short tons carbon)	Emissions (MMTCE)	Emissions (MMTCO <sub>2</sub> E)
Coal	248	57.93	100.0%	7,180	0.007	0.024
Distillate Fuel	160	43.94	100.0%	3,519	0.003	0.012
Kerosene	127	43.44	100.0%	2,759	0.003	0.009
LPG	6,150	37.96	100.0%	116,725	0.106	0.388
Natural Gas	92,191	31.87	100.0%	1,469,161	1.333	4.887
Other				-	0.000	0.000

### 1991 ☒ Default Consumption Data?

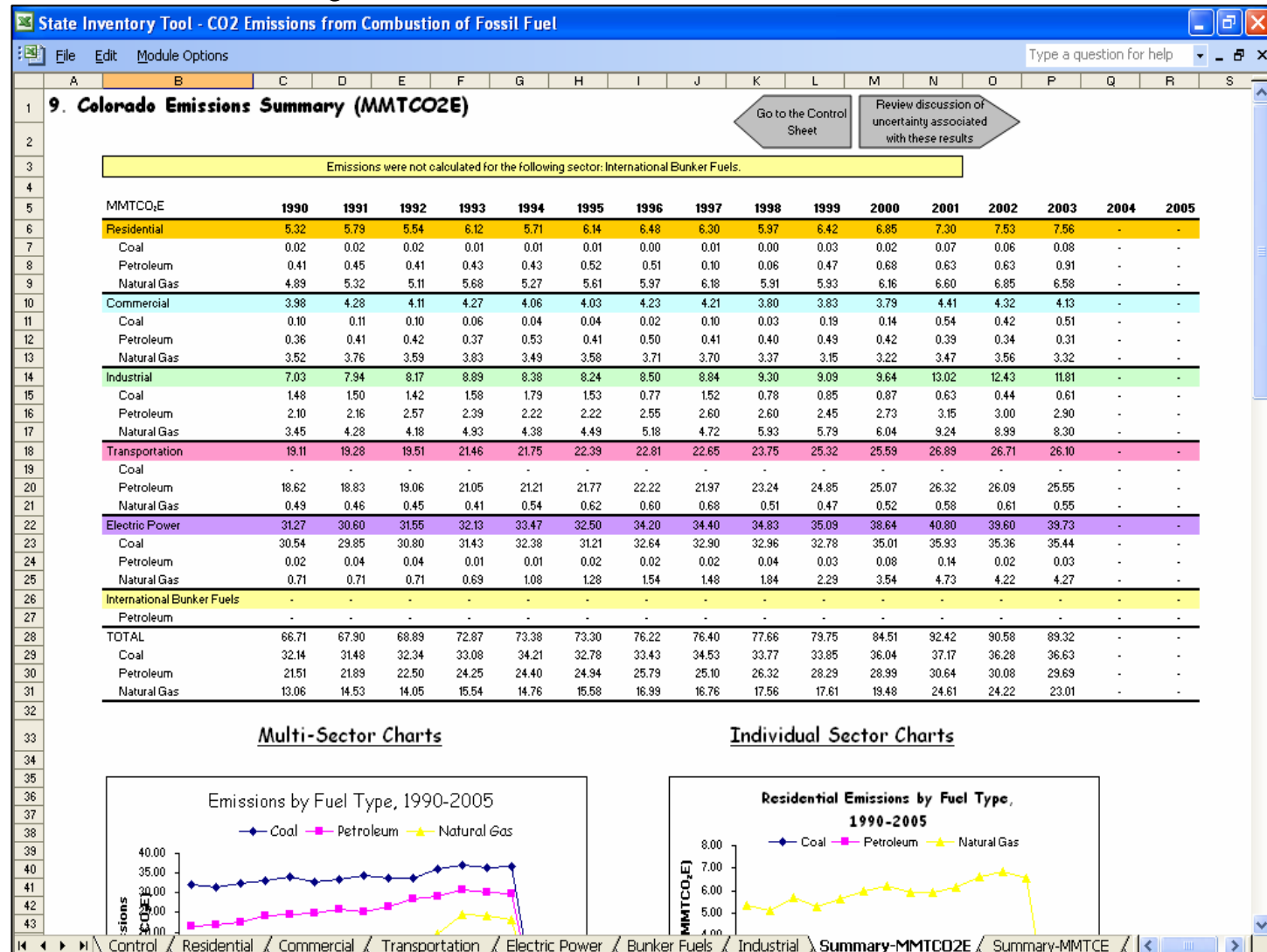
Fuel Type	Consumption (Billion Btu)	Emission Factor (lbs C/Million Btu)	Combustion Efficiency (%)	Emissions (short tons carbon)	Emissions (MMTCE)	Emissions (MMTCO <sub>2</sub> E)
Coal	251	57.93	100.0%	7,269	0.007	0.024
Distillate Fuel	127	43.94	100.0%	2,780	0.003	0.009
Kerosene	136	43.44	100.0%	2,963	0.003	0.010
LPG	6,865	37.95	100.0%	130,251	0.118	0.433
Natural Gas	100,304	31.87	100.0%	1,598,462	1.450	5.317
Other				-	0.000	0.000

### 1992 ☒ Default Consumption Data?

Fuel Type	Consumption (Billion Btu)	Emission Factor (lbs C/Million Btu)	Combustion Efficiency (%)	Emissions (short tons carbon)	Emissions (MMTCE)	Emissions (MMTCO <sub>2</sub> E)
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Other				-	0.000	0.000

Control Residential Commercial Transportation Electric Power Bunker Fuels Industrial Summary-MMTCO<sub>2</sub>E Summary-MMTCE

# Completing a Source Module: Summary Worksheet





# Completing a Source Module: Exporting Data

State Inventory Tool - CO2 Emissions from Combustion of Fossil Fuel

File Edit Module Options Type a question for help

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
49	<b>Fuel</b>	<b>Default</b>	<b>Storage Factor</b>	<b>Used</b>										
50	Asphalt and Road Oil	100%		100%										
51	Distillate Fuel	50%		50%										
52	LPG	variable by year		variable by year										
53	Lubricants	9%		9%										
54	Residual Fuel	50%		50%										
55	Feedstocks, Naphtha	variable by year		variable by year										
56	Feedstocks, Other Oils	variable by year		variable by year										
57	Misc. Petro Products	0%		0%										
58	Pentanes Plus	variable by year		variable by year										
59	Petroleum Coke	50%		50%										
60	Still Gas	80%		80%										
61	Special Naphthas	0%		0%										
62	Waxes	58%		58%										
63	Industrial Coking Coal													
64	Natural Gas													
65														
66	<b>3. through 8. Complete Individual Source Modules</b>													
67	Complete the Residential Sheet													
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83	<b>9. Review the Summary Information</b>													
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85	Go to the MMTCO <sub>2</sub> E Summary Sheet													
86	Go to the MMTCE Summary Sheet													
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90	<b>10. Export the results for use in the Synthesis Tool.</b>													
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92	Export Data													
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State Inventory Tools

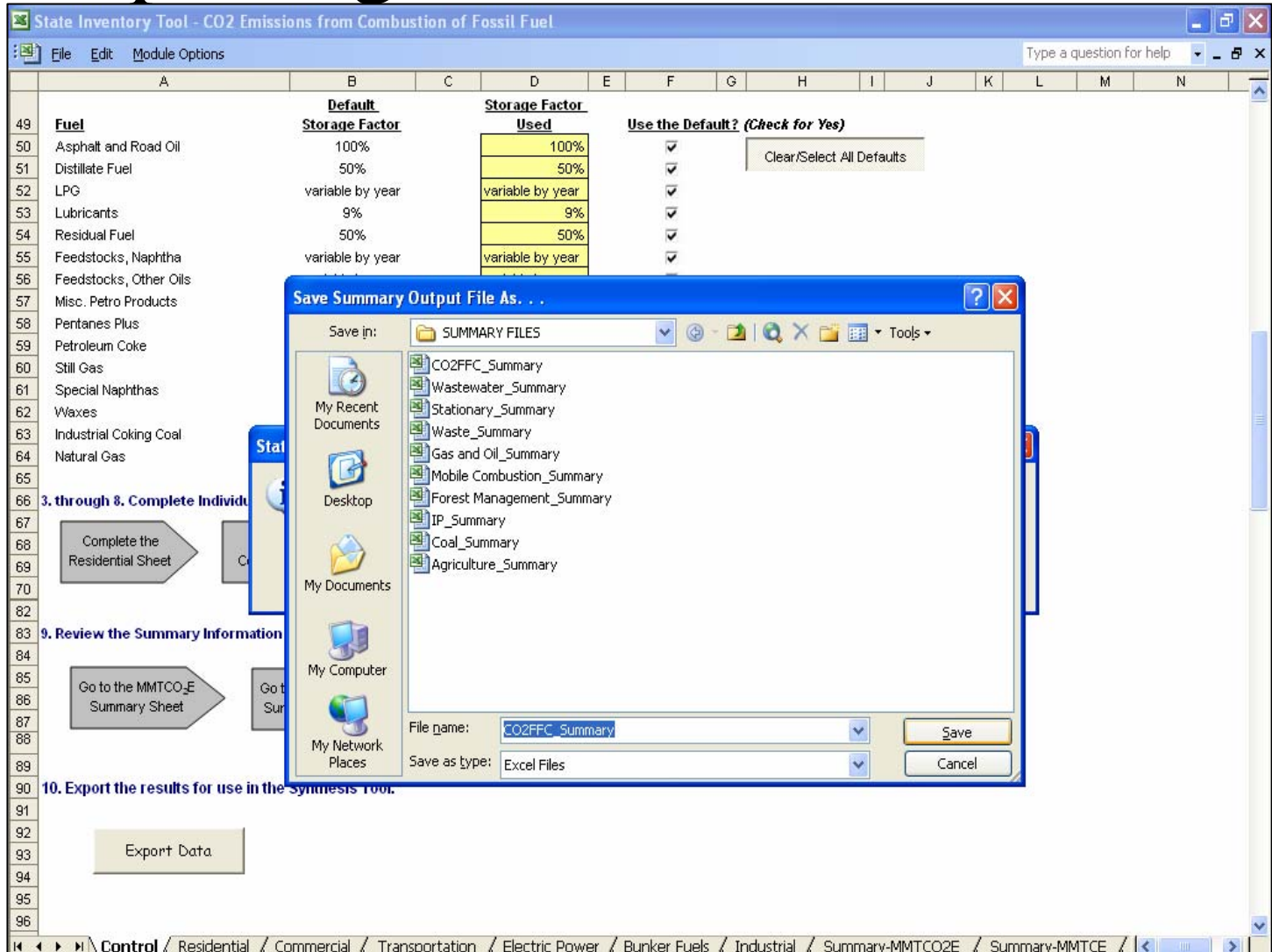
This process will generate the output file necessary for completing an inventory of greenhouse gas emissions from all sectors. Before exporting the data from this tool, please be sure that you have completed all the steps above and confirm the results on the summary sheet. If you make any changes to the data in this tool, please update the export file by running this step again.

OK

Control Residential Commercial Transportation Electric Power Bunker Fuels Industrial Summary-MMTCO<sub>2</sub>E Summary-MMTCE



# Completing a Source Module: Exporting Data



**State Inventory Tool - CO2 Emissions from Combustion of Fossil Fuel**

File Edit Module Options

Type a question for help

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
49	<b>Fuel</b>	<b>Default Storage Factor</b>	<b>Storage Factor Used</b>	<b>Use the Default? (Check for Yes)</b>										
50	Asphalt and Road Oil	100%	100%	<input checked="" type="checkbox"/>										
51	Distillate Fuel	50%	50%	<input checked="" type="checkbox"/>										
52	LPG	variable by year	variable by year	<input checked="" type="checkbox"/>										
53	Lubricants	9%	9%	<input checked="" type="checkbox"/>										
54	Residual Fuel	50%	50%	<input checked="" type="checkbox"/>										
55	Feedstocks, Naphtha	variable by year	variable by year	<input checked="" type="checkbox"/>										
56	Feedstocks, Other Oils													
57	Misc. Petro Products													
58	Pentanes Plus													
59	Petroleum Coke													
60	Still Gas													
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90	10. Export the results for use in the Synthesis Tool.													
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Save Summary Output File As...

Save in: SUMMARY FILES

- CO2FFC\_Summary
- Wastewater\_Summary
- Stationary\_Summary
- Waste\_Summary
- Gas and Oil\_Summary
- Mobile Combustion\_Summary
- Forest Management\_Summary
- IP\_Summary
- Coal\_Summary
- Agriculture\_Summary

File name: CO2FFC\_Summary

Save as type: Excel Files

Save Cancel

Control Residential Commercial Transportation Electric Power Bunker Fuels Industrial Summary-MMTCO<sub>2</sub>E Summary-MMTCE

# Completing a Source Module: Exporting Data

State Inventory Tool - CO2 Emissions from Combustion of Fossil Fuel

File Edit Module Options Type a question for help

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
49	<b>Fuel</b>	<b>Default Storage Factor</b>		<b>Storage Factor Used</b>		<b>Use the Default? (Check for Yes)</b>								
50	Asphalt and Road Oil	100%		100%		<input checked="" type="checkbox"/>								
51	Distillate Fuel	50%		50%		<input checked="" type="checkbox"/>								
52	LPG	variable by year		variable by year		<input checked="" type="checkbox"/>								
53	Lubricants	9%		9%		<input checked="" type="checkbox"/>								
54	Residual Fuel	50%		50%		<input checked="" type="checkbox"/>								
55	Feedstocks, Naphtha	variable by year		variable by year		<input checked="" type="checkbox"/>								
56	Feedstocks, Other Oils	variable by year		variable by year		<input checked="" type="checkbox"/>								
57	Misc. Petro Products	0%		0%		<input checked="" type="checkbox"/>								
58	Pentanes Plus	variable by year		variable by year		<input checked="" type="checkbox"/>								
59	Petroleum Coke	50%		50%		<input checked="" type="checkbox"/>								
60	Still Gas	80%		80%		<input checked="" type="checkbox"/>								
61	Special Naphthas	0%		0%		<input checked="" type="checkbox"/>								
62	Waxes	58%		58%		<input checked="" type="checkbox"/>								
63	Industrial Coking Coal	10%		10%		<input checked="" type="checkbox"/>								
64	Natural Gas	variable by year				<input checked="" type="checkbox"/>								
65														
66	<b>3. through 8. Complete Individual Sector Worksheets</b>													
67		Complete the Residential Sheet	Complete the Commercial Sheet	Complete the Transportation Sheet										
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93		Export Data												
94														
95														
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State Inventory Tool

The summary data were successfully exported!

OK

Control Residential Commercial Transportation Electric Power Bunker Fuels Industrial Summary-MMTCO<sub>2</sub>E Summary-MMTCE





# Tool Demonstration: State Inventory Tools





# Q&A for the State Inventory Tool Modules



# Projection Tool Overview

- Project emissions by gas and by sector through 2020
- Import historic emissions from SIT modules (if applicable)
- Project future emissions
  1. Based on historical data
  2. Forecasting using projected activity data



# Projection Example: CO<sub>2</sub>FFC

- Projections based on EIA's regional energy consumption data to 2020
- State specific estimates calculated using historic percentage of energy consumption in the region





# Tool Demonstration: Projection Tool



# Q&A for the Projection Tool



# For More Information:

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