MOVES Batch Mode:

Setting up and running groups of related MOVES run specifications

EPA Office of Transportation and Air Quality

11/3/2010

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Webinar Logistics

- **Please use "question box" to send any questions**
  - We'll pause periodically during the webinar to answer them
  - We can address unanswered questions after the webinar
- **During this webinar, we'll conduct a few polls**
  - Please participate
- **Slides and demos will be posted on MOVES website**
  - http://www.epa.gov/otaq/models/moves/trainingsessions.htm

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Attendee Control Panel

My Details

Shows the attendee name and Satisfaction Rating. Attendees can change their Satisfaction Rating by clicking on the drop-down arrow

Webinar Info

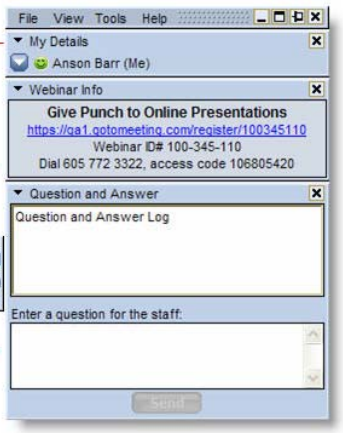
Provided for quick reference

Grab Tab

Enables attendees to minimize the Control Panel to the side of their desktops and still access Viewer tools

Question and Answer

If turned on by an organizer, attendees can submit questions and review answers. Broadcast messages from an organizer will also show here



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Course Outline

- Introduction
- Command Line Interface
  - Set up
  - Simple Run
- Multiple Run Spec Creator
- Generate Importer XML File Tool
- Wrap Up

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Course Prerequisite

- **Experience using MOVES to set up and execute single runs**
  - We will assume that users know how to set up individual runs using the MOVES graphical interface
  - This background material is covered in the MOVES 2-day hands-on training and in the MOVES User Guide

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Course Goals

- **Understand when "batch" runs can be useful**
- **Learn to set up and run simple batch runs with "command line" instructions**
- **Learn to create a set of related run specifications using the Multiple Run Spec Creator**
- **Learn to save and edit importer scripts to create a series of related input databases.**

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Course Format

- **Quick lecture from slides (will be available on web)**
- **Polls**
- **Questions from participants**
- **Demonstrations (will be available on web)**
  - We do not expect participants to follow along in real time
  - Participants may want to recreate the demonstrations later
    - We'll be using files from the MOVES2010 2-day Training
    - These are available on the web at http://www.epa.gov/otaq/models/moves/training.htm
    - Necessary commands are included on the slides

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Computer Requirements for Batch Runs

- **Access to the Command Prompt**
- **Access to Note Pad or some other editing program**
- **Ability to run batch files**

Sometimes these capabilities are turned off for security reasons.

If you are not sure if you have these capabilities on your computer, ask your local information technology support staff.

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Why not just one big run?

- **MOVES often works more quickly when a large run is separated into several smaller runs.**
- **Separating a large run into several smaller ones allows easier recovery from run-time errors, power failures, etc.**
- **Separating runs allows users to tailor runs to specific needs**
  - Desired aggregation may vary by emission process or pollutant
- **Often MOVES runs required to be done at the County/Year level**

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Splitting Runs to Speed Up MOVES

- **Separate runs by calendar year**
  - Multi-year runs can be much slower than a series of single-year runs
- **Experiment with separate runs by county and month**
- **Separate evaporative emissions if you can do temporal pre-aggregation for other processes**
  - Evaporative emissions must be run by hour
  - Other processes can be run for longer times
    - Choice depends on precision desired
    - See MOVES Technical Guidance for EPA requirements

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Overview of the Batch Process (1 of 2)

1. **Create an initial Run Spec using MOVES graphical user interface (GUI).**
2. **Use this as a template to create a group of related Run Specs**
   1. Most of the elements are the same, but a few vary
   2. Since Run Specs are text files, you can make the changes with an editor, a script or macro, or MOVES' "Multi Run Spec Creator"

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Overview of the Batch Process (2 of 2)

3. **For each Run Spec, create the required input database(s)**
   1. You can do this with MySQL commands, scripts or the MOVES "Importer XML" tool
4. **Use a text editor or tool to create a *.bat file that lists the Run Specs you want to run as a "batch"**
5. **Run this "Batch file**

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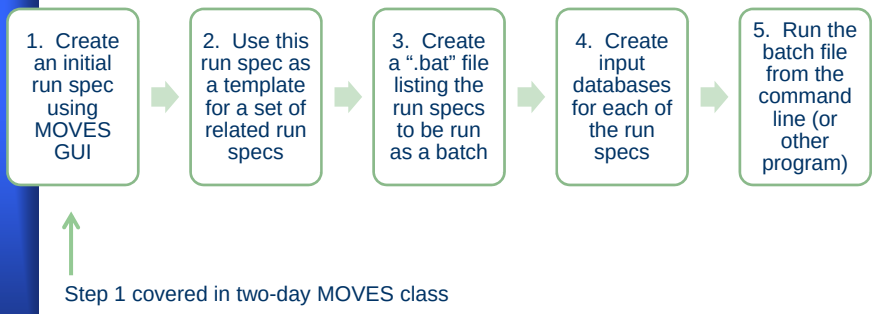
Batch Process Flow Chart



Step 1 covered in two-day MOVES class

Command Line Interface

Section Overview

- When to change from the graphical user interface (GUI) to the command line interface (CLI).
- Window Command Prompt
  - Set up
- Simple Runs from the Command Prompt
- Additional Resources

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When to use the Command Line

- Numerous runs to complete.
- Want to save long log files
- Repeatability
- Network or power outages

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DOS / DOS BOX/ Shell / CMD Prompt

- **Command Prompt** (aka., command-line interpreter)
  - C:\Windows\system32\cmd.exe
  - %comspec%
- **cmd.exe** is a Windows program that acts as a DOS-like command line interpreter.

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How to get to the Command Prompt

- **Three options**
  - Start menu -> Run ->cmd [ENTER]
  - Windows Key ->R
  - Make a desktop icon

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How to make a desktop icon

- **On the desktop…**
  - right click
  - New ->Shortcut->C:\windows\system32\cmd.exe
  - Name: CMD
  - Right Click->Properties->Start in:
  - You favorite working directory here (use the MOVES directory).

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How to modify the CMD Shortcut (1 of 2)

- **Right click on the CMD icon.**
- **Choose Properties.**
- **Choose Options tab.**
  - Command History
    - Set Buffer Size to 999 to maximize saved history.
  - Edit Options
    - Check Quick Edit to allow editing of DOS commands.
    - Check Insert Mode to not overwrite existing text.

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How to modify the CMD Shortcut (2 of 2)

- **Choose Layout tab.**
  - Screen Buff Size
    - Set Height to 9999 to maximize scrolling.
  - Font/Colors -> Select what you like.
- **Choose Shortcut tab.**
  - Change Start In to MOVES directory.
- **Click Apply to save.**

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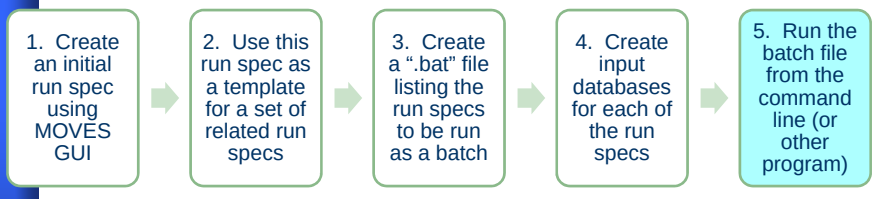
Batch Process Flow Chart



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How to run MOVES using command line entry

- **Open a DOS window using your CMD icon.**
  - You should be in your MOVES directory.
  - If not, change directory to MOVES.
- **Type setenv.bat <Return>**
  - This will set the paths for MOVES operation.

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How to run MOVES using command line entry (cont.)

- **The command elements to run MOVES:**
  - Java
  - -Xmx512M
  - gov.epa.otaq.moves.master.commandline.MOVESCommandLine
  - –r
  - "c:\myrunspec.mrs" (This is the name and path for your runspec.)
- **This command must all be in a single line such as:**

java -Xmx512M gov.epa.otaq.moves.master.commandline.MOVESCommandLine –r "myrunspec.mrs"

- **Note:**
  1. Appendix C in the MOVES User Guide is not correct on the syntax to run MOVES from the command line

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A Few Tools and Tips

- **Ctrl-C will stop execution**
- **“Right click” will paste text from the clipboard**
- **Up arrow (↑) will scroll through previous commands**
- **When copying commands, be careful of hidden formatting and characters**

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Additional Resources

- **Microsoft** Command-line reference A-Z
  - http://www.microsoft.com/resources/documentation/windows/xp/all/proddocs/en-us/ntcmds.mspx?mfr=true
- **Wikipedia discussion of DOS commands**
  - http://en.wikipedia.org/wiki/DOS
- **DOS Batch Forum**
  - http://www.dostips.com/

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Multiple Run Spec Creator

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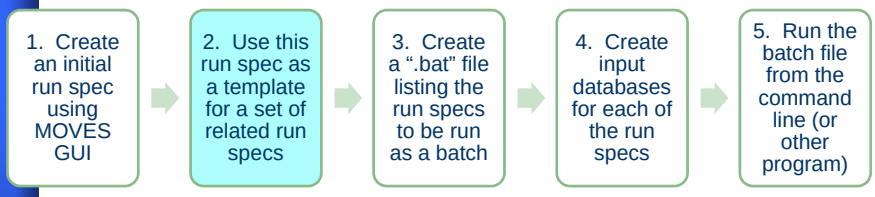
Batch Process Flow Chart



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What is the Multiple Runspec Creator?

- Generates copies of an existing run specification with changes specified in a control file.
- You can set the county and calendar year used in each copy.
- Allows different databases to be used in each copy.
- Creates a batch file that will run all of the run specifications in a single command line entry.

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Using the Multiple Runspec Creator

- The Multiple Runspec Creator is located in the Tools pull down menu.
- You ***must*** have a valid run specification ***loaded*** in MOVES in order to use the tool.
- You ***must*** have a Runspec Template Control File in order to use the tool.
- You can create a control file by selecting the Create Template button in the Multiple Runspec Creator.

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Create a Runspec Template Control File

- **Load a valid run specification into MOVES.**
  - National scale runspecs will not work.
- **Open the Multiple Runspec Creator.**
- **Create a Runspec Template Control File.**
  - Use the Create Template button.
  - Make sure to use an XLS extension to get a spreadsheet.
- **Open the Runspec Template Control File.**
  - Add rows specifying the changes you want.
  - Each row will generate a separate run specification.

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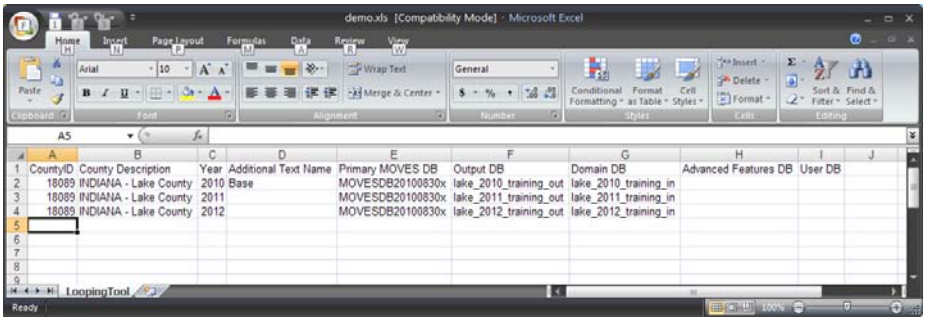
Example Runspec Control File



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Runspec Template Control File (1 of 4) (User Guide Page 78)

- CountyID - Mandatory. The FIPS ID of the county or custom domain (generic county) in the format 99999
- County Description - Describes the county. Not mandatory, but is helpful as it gets stored within each RunSpec. It will be the label for the generic county if the Custom Domain option is used.
- Year - Mandatory. A calendar year contained within the current MOVES default database, typically 1990 and 1999-2050 inclusive.

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Runspec Template Control File (2 of 4) (User Guide Page 78)

- Additional Text Name - Optional, 20 characters maximum. Additional text to be included in the file name of a run specification.
- Primary MOVES DB - Name of the primary MOVES database to be used with the RunSpec (See MOVES User Guide).
- Output DB - Name of the database to store the created RunSpec's output. If blank, the created RunSpec will use the output database of the currently loaded RunSpec.

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Runspec Template Control File (3 of 4) (User Guide Page 78)

- **Domain DB - When using County or Project domains, MOVES requires an input database specific to the domain. If blank, the model will use the database named in the RunSpec.**
  - You can create a family of related domain databases using Importer XML (see next section)
- **Advanced Features DB - This field specifies the database where the Advanced Performance Features panel data will be saved.**

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Runspec Template Control File (4 of 4) (User Guide Page 78)

- **User DB - The MOVES GUI allows users to supply their own custom data using the Manage Input Data Sets panel. On that panel, zero or more user databases are listed. Such databases can be specified in the Control File in the User DB column and the columns to the right of it. For example, if two databases are desired, fill the User DB column with the first database, and fill the next column with the second.**

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File Name Prefix

- You must supply a prefix to be used for the file names.
- The prefix cannot contain the &, :, /, \, * or ? characters.
- The prefix characters you supply will be used to begin each run specification file name.
- Choose a descriptive prefix, perhaps with a project number or metropolitan area name.

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Run Specification File Names

- Each file name will begin with your prefix.
- Each file name will include the county FIPS and the calendar year.
- Each file name will end with the additional text specified in the Runspec Template Control File for that run specification.
- Each file name will use the MRS (MOVES Run Specification) extension.

<prefix>_<countyID>_<year>[_<additional text>].mrs

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Create Multiple Run Specifications (1 of 2)

- **Load a valid run specification into MOVES.**
  - National scale runspecs will not work.
- **Open the Multiple Runspec Creator.**
- **Use the Browse button to select the Runspec Template Control File you created.**
- **Enter a File Name Prefix into the box.**
- **Browse to select the Runspec Output Directory**
  - All of the run specifications and the batch file will be written to this directory.
  - If the directory does not exist, it will be created automatically.

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Create Multiple Run Specifications (2 of 2)

- **Click the Create Runspecs button to generate the run specifications and batch file.**
  - Note: existing Run Specs with same name will be over-written.
- **Each run specification generated will be similar to the original, with the changes you specified in the Runspec Template Control File.**
- **A single batch file will be created that can be used to run all of the run specifications.**

<prefix>_ExecuteRunSpecs.bat

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Batch Process Flow Chart

1. Create an initial run spec using MOVES GUI
2. Use this run spec as a template for a set of related run specs
3. Create a ".bat" file listing the run specs to be run as a batch
4. Create input databases for each of the run specs
5. Run the batch file from the command line (or other program)

Example Batch File

```
@echo off
rem Script generated by the MOVES Multiple RunSpec Creator
rem Based on control file: C:\Documents and Settings\dbrzezin\My Documents\Epa\RunSpecs\Demo\demo.xls
rem ----------------------------------------------------------
echo Changing to the MOVES folder and compiling code...
C:
cd "C:\Program Files\MOVESGHGSource20100826"
call setenv.bat
call ant compile
rem ----------------------------------------------------------
echo Running DEMO_18089_2010_Base.mrs
java -Xmx512M gov.epa.otaq.moves.master.commandline.MOVESCommandLine -r
"C:\EPA\runspecs\DEMO_18089_2010_Base.mrs"
echo Running DEMO_18089_2011.mrs
java -Xmx512M gov.epa.otaq.moves.master.commandline.MOVESCommandLine -r "C:\EPA\runspecs\DEMO_18089_2011.mrs"
echo Running DEMO_18089_2012.mrs
java -Xmx512M gov.epa.otaq.moves.master.commandline.MOVESCommandLine -r "C:\EPA\runspecs\DEMO_18089_2012.mrs"
```

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Contents of the Batch File

- @echo – Controls writing to the screen.
- rem – These rows are comments.
- cd – Changes directory to MOVES.
- call setenv.bat – Sets paths for MOVES operation.
- call ant compile – Recompiles the MOVES code.
- java …. – Command line to run MOVES.

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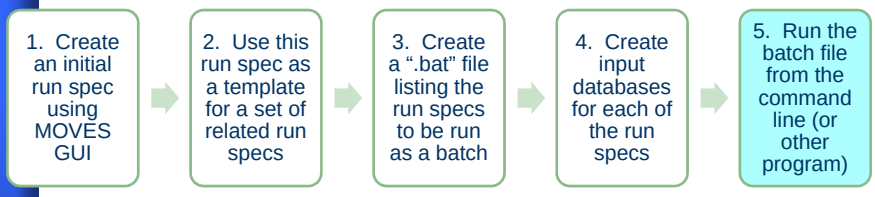
Batch Process Flow Chart



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Running the Batch File

- The batch file will run all of the run specifications generated using a single command line entry.
- Close MOVES before running the batch file, otherwise MOVES will not let the batch file proceed, since there is already an instance of MOVES running.
- Double click on the batch file icon to run the batch file, or
- Run the batch file from the command line by typing the batch file path and name.

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Run Time Issues

- If you move the run specifications to another directory after you create the batch file, the batch file will no longer work.
- You must create any databases you specify in the Runspec Template Control File. These databases must exist and be valid for MOVES to run.
- Be sure to close MOVES before you run the batch file.

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Other ways to create batch files

- **You can directly edit a batch file with a text editor**
  - Add rows with additional Run Specs
  - Update remarks with your own comments
- **You can use scripts to create batch files from lists of Run Specs**

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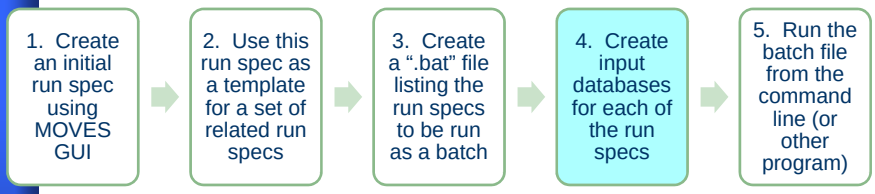
Generate Importer XML File Tool

Batch Process Flow Chart



Importer XML Context

- **Local inputs are stored in input databases**
- **MOVES graphical importers help users create these databases**
  - Data Importer
  - County Data Manager
  - Project Data Manager
- **The graphical importers provide file-by-file instructions and help importing the correct information**
- **But, when managing lots of similar files, need an automated process**

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What is the Importer XML? (1 of 2)

- **The Importer XML is a structured text file which provides instruction on which spreadsheets or text files should be imported into which tables**
  - XML stands for “EXtensible Markup Language”
  - Tags <in brackets> identify the data to the program that reads the XML file
- **The Importer XML includes:**
  - information about the Run Spec associated with the database and
  - the source files used for constructing the database

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What is the Importer XML? (2 of 2)

- **MOVES includes a program that can read the Importer XML and construct the database that the XML describes.**
- **This program is run from the command line with a “-i” command.**
- **The XML file can be edited with a text editor or script to create a different input database**

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Example Run Spec Portion of XML Importer File

```
- <moves>
- <importer mode="county">
- <filters>
- <geographicselections>
  <geographicselection type="COUNTY" key="18089" description="INDIANA - Lake
 County" />
  </geographicselections>
- <timespan>
  <year key="2010" />
  <month id="7" />
  <day id="5" />
  <beginhour id="8" />
  <endhour id="8" />
  <aggregateBy key="Hour" />
  </timespan>
- <onroadvehicleselections>
```

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Example Import Portion of XML Importer File

```
<databaseselection servername="localhost" databasename="lake_2010_training_2_in"
    />
- <agedistribution>
- <description>
- <![CDATA[   ]]>
  </description>
- <parts>
- <sourceTypeAgeDistribution>
  <filename>C:\Documents and Settings\mbeardsl\My Documents\My
     Documents\1Megan\1ngm\run specs\CDM Input
     Files\lake_age_mkb.xls</filename>
  <section>lake_age_mkb</section>
  </sourceTypeAgeDistribution>
  </parts>
  </agedistribution>
```

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How Do I Create Importer XML?

1. **Use graphical importer to create initial input database.**
   1. Do this all in one sitting to make sure that all the commands are recorded.
2. **Before closing importer, go to "Tools" tab and click "Generate Importer XML File"**
   1. Save file with desired name and .xml suffix
3. **Use text editor to open the file, edit as desired.**
4. **Rename with .xml suffix and save to desired directory**

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How should I edit the XML file?

- **Use Notepad or some other text editor**
- **Change the Run Spec and Importer sections of the XML to correspond to the desired Run Specs and data sources**
  - Make sure to include path names if data sources are in other directories
- **Save each Importer XML file with an appropriate name**
- **Or users may develop a script or macro to automatically edit a series of XML files**

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Running the XML file

- **Go to Command Prompt**
- **cd to MOVES directory if needed**
- **Type "setenv" to establish path names**
- **Type**
  - Java -Xmx512M gov.epa.otaq.moves.master.commandline.MOVESCommandLine –i MYFILE.xml

  Where "MYFILE" is your file name

This will create an input database you can call in run specs

Full instructions in Appendix C of MOVES User Guide

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Troubleshooting

- **Some data files may be too large to import from the command line.**
  - In this case, save the data sheets and delete supporting worksheets, or break the run into smaller runs and smaller data files.
- **The "generic importer" is not yet supported by the importer commands**
  - This will lead to error messages when importing, but should not impact results
  - If desired, you can remove the "generic" portion of the XML script
- **Sometimes when importing will get warning of "Invalid PollutantProcessAssociation," for valid combinations**
  - This can be ignored

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Wrap Up

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Summary

We have demonstrated how to:

1. Use the Command Prompt and set up an icon on your machine
2. Use a Run Spec as a template for additional Run Specs
3. Create a batch file listing desired Run Specs
4. Create additional input databases for each Run Spec
5. Run the batch file from the Command Prompt and Windows Explorer

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Other notes

- **While multiple runs can output to the same database, we recommend creating a separate output database for each run**
  - Failures & repeats are isolated from successful runs
  - Output databases can be easily linked with their RunSpecs.
  - Successful output databases can be concatenated into a single final database
- **Create and use a standard naming convention**
  - Helps when creating batch runs
  - Helps keep track of runs, input and output databases
  - We use “runname.mrs,” runname_in,” and “runname_mo”

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Additional MOVES Training

- **MOVES training a cooperative effort of EPA and FHWA staff**
- **This is the second of a series of webinars**
  - First was “Introduction to MOVES”
  - Other topics to be announced soon
  - Suggest a topic and we will see what we can do!
- **Currently giving MOVES2010 hands-on course:**
  - Training already given in 9 locations
  - 6 more locations have been scheduled
  - Several additional locations yet to be scheduled

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Your input needed

- If you have ideas for other tools that would help improve batch mode processing, let us know.
- If you have created tools that help you do batch processing efficiently, we'd be glad to help you share them with others.
- If you have suggestions for other trainings or webinars, please tell us.

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Visit the MOVES Website:

- Main Page
  - www.epa.gov/otaq/models/moves/
- Training Sessions
  - www.epa.gov/otaq/models/moves/trainingsessions.htm
- Training Materials
  - www.epa.gov/otaq/models/moves/training.htm
- Background Information
  - www.epa.gov/otaq/models/moves/movesback.htm
- Listserver Information
  - www.epa.gov/otaq/models/mobilelist.htm

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Thank You

- Thanks for attending this training on running MOVES in Batch Mode
- Please answer the questions in the webinar exit survey to help us improve our training
- If you have additional questions or comments, email us:
  - mobile@epa.gov

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