

Understanding MOVES Project Level Model

Presentation for FACA
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Presentation Outline

- **Description of MOVES Project Capability**
- **Example**
 - Defining a MOVES Project
 - MOVES Runspec
 - MOVES Project Inputs



MOVES Domains

- National Scale
- County Level
- Project Domain



Description

- **Pollutants**

- Project Level models all pollutants
- Chained pollutants require inputs for the entire 'chain'

- **Processes**

- Running, Start, Extended Idle, Braking, Tire
- Evaporative Processes are NOT covered



Description (con't 1)

- **Project Level utilizes MOVES ...**
 - Emission rates
 - Correction factors
- **Project Level does NOT utilize MOVES ...**
 - Growth rates
 - VMT estimates
 - Population data
 - Operating distributions



Description (con't 2)

- **Project Level allows only one combination of ... per run**
 - County
 - Year
 - Month
 - Hour



Description (con't 3)

- **Project level does MOVES modeling at the 'Link' level**
 - Roadway links
 - Off-network link



Description (con't 4)

- **Project level models ‘average’ conditions on a set of connected link(s).**
 - NOT a SimCity type simulator
 - NOT a Traffic demand modeling
- **All dynamic aspects of the MOVES Project must be planned, calculated and entered as inputs.**

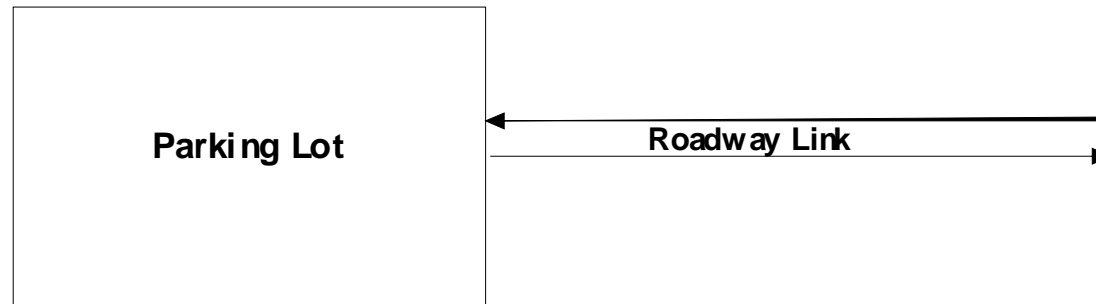


Example Project



Define the Project

Basic Schematic of the Project



Project Assumptions

- Only two links (inbound and outbound from a parking lot) exist.
- The two links and the off-network link are independent
- The off-network link consists of parking, extended idle and starts.
- Only heavy-duty combination long-haul diesel trucks are present on the roadway
- Only nitrogen oxide emissions are included.
- Only one hour of operation is considered.



Specific Project Data (parameters)

● <u>Parameter Name</u>	<u>Parameter</u>
● Location County	Washtenaw County, MI
● Calendar Year	2009
● Month	January
● Weekday/Weekend	Weekday
● Time	11:00 PM to 11:59:59 PM
● Temperature	28.5 F
● Humidity	69.5 %
● Roadtype of links	Rural Unrestricted Access



Specific Project Data (link data)

● <u>Parameter Name</u>	<u>Parameter</u>
● Roadway Link Length	0.998 miles
● Link Traffic Volume - In	100 trucks per hour
● Link Traffic Volume - Out	10 trucks per hour
● Link Average Speed - In	28.5 miles per hour
● Link Average Speed – Out	28.5 miles per hour



Specific Project Data (Off-network data)

- | <u>Parameter Name</u> | <u>Parameter</u> |
|----------------------------|------------------|
| Average Vehicle Population | 200 vehicles |
| Start Fraction | 0.03 |
| Extended Idle Fraction | 0.90 |
| Parked Vehicle Fraction | 0.09 |



Specific Project Data (start data)

OpmodeID Code	Operating Mode Description	Operating Mode Fraction
101	Soak Time < 6 minutes	0.00
102	6 minutes <= Soak Time < 30 minutes	0.05
103	30 minutes <= Soak Time < 60 minutes	0.30
104	60 minutes <= Soak Time < 90 minutes	0.10
105	90 minutes <= Soak Time < 120 minutes	0.50
106	120 minutes <= Soak Time < 360 minutes	0.00
107	360 minutes <= Soak Time < 720 minutes	0.00
108	720 minutes <= Soak Time	0.05
200	Extended Idle	1.00



Spreadsheet Inputs

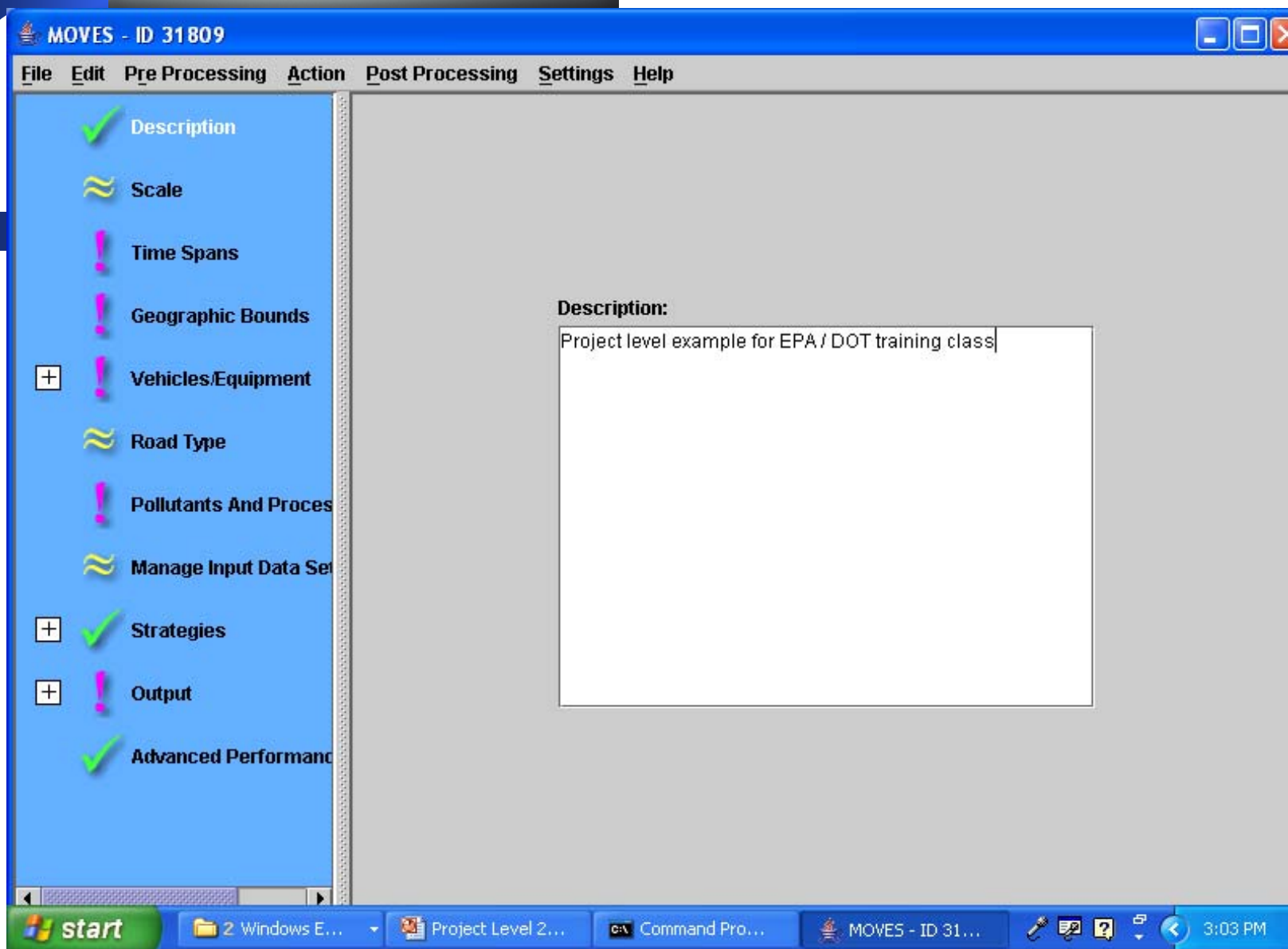
- DriveScheduleSecondLink
- OffNetworkLink
- ZoneMonthHour (temperature)
- LinkSourceTypeHour
- SourcetypeAgeDistribution
- FuelSupply
- Link
- OpModeDistribution



Creating a MOVES Runspec



MOVES



MOVES

MOVES - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help



Description

Ready



Scale



Time Spans



Geographic Bounds



Vehicles/Equipment



Road Type



Pollutants And Proces



Manage Input Data Set



Strategies



Output



Advanced Performance

Domain/Scale

☐ National Use the default national database with default state and local allocation factors.



Caution: Do not use this scale setting for SIP or conformity analyses. The allocation factors and other defaults applied at the state or county level have not been verified against specific state or county data and do not meet regulatory requirements for SIPs and conformity determinations.

☐ County Select or define a single county that is the entire domain.

Note: Use this scale setting for SIP and regional conformity analysis. Use of this scale setting requires user-supplied local data for most activity and fleet inputs.

☒ Project Use project domain inputs.

Note: Use this scale setting for project-level analysis for conformity, NEPA, or any other regulatory purpose. Use of this scale setting requires user-supplied data at the link level for activity and fleet inputs that describe a particular transportation project.

Calculation Type

☒ Inventory Mass and/or Energy within a region and time span.

☐ Emission Rates Mass and/or Energy per unit of activity.



Caution: Changing these selections changes the contents of other input panels. These changes may include losing previous data contents.

Ready...



Ed Glove...

for Gary ...

2 Micro...

Comman...

MOVES - ...

10:05 AM

MOVES

MOVES - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

+ ! Vehicles/Equipment

≈ Road Type

! Pollutants And Proces

≈ Manage Input Data Set

+ ✓ Strategies

+ ! Output

✓ Advanced Performance

Time Aggregation Level

☐ Year ☐ Month ☐ Day ☒ Hour

Years

Select Year: 2009 ▼

Add

Years:

2009

Remove

Months

☒ January

☐ July

☐ February

☐ August

☐ March

☐ September

☐ April

☐ October

☐ May

☐ November

☐ June

☐ December

Select All

Clear All

Days

☐ Weekend

☒ Weekdays

Select All

Clear All

Hours

Start Hour: 23:00 - 23:59 ▼

End Hour: 23:00 - 23:59 ▼

Select All

Clear All

Ready...

start

Ed Glove...

for Gary ...

2 Micro...

Comman...

MOVES - ...

10:06 AM

MOVES

MOVES - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans

! Geographic Bounds

+ ! Vehicles/Equipment

≈ Road Type

! Pollutants And Processes

≈ Manage Input Data Set

+ ✓ Strategies

+ ! Output

✓ Advanced Performance

Region:

☐ Nation

☐ State

☒ County

☐ Zone & Link

☐ Custom Domain

States:

MAINE

MARYLAND

MASSACHUSETTS

MICHIGAN

MINNESOTA

MISSISSIPPI

MISSOURI

MONTANA

NEBRASKA

NEVADA

Counties:

MICHIGAN - Shiawassee County

MICHIGAN - St. Clair County

MICHIGAN - St. Joseph County

MICHIGAN - Tuscola County

MICHIGAN - Van Buren County

MICHIGAN - Washtenaw County

MICHIGAN - Wayne County

MICHIGAN - Wexford County

Select All

Add

Domain Input Database

The Project domain scale requires a database of detailed data.

Server:

Database:

Enter/Edit Data

Geographic Bounds Requirements

Please select a domain database.

Ready...



MOVES

MOVES - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help

	Fuels:	Source Use Types:	Selections:
✓ Description	Compressed Natural Gas ...	Combination Long-haul Tr...	Diesel Fuel - Combination Long-haul Truck
✓ Scale	Diesel Fuel	Combination Short-haul Tr...	
✓ Time Spans	Electricity	Intercity Bus	
! Geographic Bounds	Ethanol (E85)	Light Commercial Truck	
- ✓ Vehicles/Equipment	Gasoline	Motor Home	
✓ On Road Vehi	Liquid Propane Gas (LPG)	Motorcycle	
≈ Road Type		Passenger Car	
! Pollutants And Proc		Passenger Truck	
≈ Manage Input Data		Refuse Truck	
+ ✓ Strategies		School Bus	
+ ! Output		Single Unit Long-haul Truck	
✓ Advanced Performa		Single Unit Short-haul Tru...	
		Transit Bus	

Select All Select All Delete

Add Fuel/Type Combinations

Ready...



MOVES

MOVES - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help

Description ✓
Scale ✓
Time Spans ✓ Ready
Geographic Bounds !
Vehicles/Equipment - ✓
On Road Vehicle ✓
Road Type ✓
Pollutants And Processes !
Manage Input Data ≈
Strategies + ✓
Output + !
Advanced Performance ✓

Available Road Types:

- Off-Network
- Rural Restricted Access
- Rural Unrestricted Access**
- Urban Restricted Access
- Urban Unrestricted Access

Selected Road Types:

- Off-Network
- Rural Unrestricted Access

Select All Add Delete

Ready...

start Ed Glove... for Gary ... 2 Micro... C:\ Comman... MOVES - ... 10:09 AM



MOVES

MOVES - C:\Eds C Files\ReasonGroup Tasks\Task904\for Gary Dolce\Project Level HD Example.mrs - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Description

✓ Scale

✓ Time Spans Ready

✓ Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle Equipment

✓ Road Type

✓ Pollutants And Processes

✓ Manage Input Data Sets

[+] ✓ Strategies

[-] ✓ Output

✓ General Output

	Running Exhaust	Start Exhaust	Brakewear
<input type="checkbox"/> Total Gaseous Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Non-Methane Hydrocarbons	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Non-Methane Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Total Organic Gases	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Volatile Organic Compounds	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Carbon Monoxide (CO)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Oxides of Nitrogen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Primary Exhaust PM10 - Total	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM10 - Organic Carbon	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM10 - Elemental Carbon	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM10 - Sulfate Particulate	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM10 - Brakewear Particulate			
<input type="checkbox"/> Primary PM10 - Tirewear Particulate			
<input type="checkbox"/> Primary Exhaust PM2.5 - Total	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM2.5 - Organic Carbon	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM2.5 - Elemental Carbon	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM2.5 - Sulfate Particulate	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Primary PM2.5 - Brakewear Particulate			<input type="checkbox"/>
<input type="checkbox"/> Primary PM2.5 - Tirewear Particulate			
<input type="checkbox"/> Total Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Petroleum Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Fossil Fuel Energy Consumption	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Methane (CH4)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Nitrous Oxide (N2O)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Atmospheric CO2	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> CO2 Equivalent	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Benzene	<input type="checkbox"/>	<input type="checkbox"/>	

View the run error log for various MOVES runs

start Ed Glover... for Gary ... 2 Windo... MOVES - ... Microsoft ... 11:19 AM



MOVES

MOVES - ID 31809



File Edit Pre Processing Action Post Processing Settings Help

✓ Description

✓ Scale

Ready

✓ Time Spans

! Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle

✓ Road Type

✓ Pollutants And Processes

≈ Manage Input Data

[+] ✓ Strategies

[-] ! Output

✓ General Output

Output Emissions

Output Database

Server:

Database: ProjectLevel_Output ▼

Refresh

Create Database...

Output

☒ Time Factors (Mass per time unit/Energy per time unit)

Time Units:

Hours ▼

Mass Units:

Grams ▼

Energy Units:

Joules ▼

Distance Units:

▼



start

2 Windows Explorer

Project Level 2...

Command Prom...

MOVES - ID 31...

3:07 PM

MOVES

MOVES - C:\Eds C Files\ReasonGroup Tasks\Task904\for Gary Dolce\Project Level HD Example.mrs - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help

✓ Time Spans

✓ Geographic Bounds

[-] ✓ Vehicles/Equipment

✓ On Road Vehicle

✓ Road Type

✓ Pollutants And Process

✓ Manage Input Data

[+] ✓ Strategies

[-] ✓ Output

✓ General Output

✓ Output Emission

✓ Advanced Performance

Always

☒ Time Hour

☒ Location LINK

☒ Pollutant

for All Vehicle/Equipment Categories

☐ Model Year

☒ Fuel Type

☒ Emission Process

☐ Estimate Uncertainty

Number of iterations: 2

☐ Keep pseudo-randomly sampled input

☐ Keep output from each iteration

On Road/Off Road

☒ On Road/Off Road

On Road

☒ Road Type

☒ Source Use Type

☐ SCC

Off Road

☐ Segment

☐ SCC

☐ HP Class



MOVES

MOVES - C:\Eds C Files\ReasonGroup Tasks\Task904\for Gary Dolce\Project Level HD Example.mrs - ID 33001

File Edit Pre Processing Action Post Processing Tools Settings Help

Time Spans
Geographic B
Vehicles/Equi
On Road
Road Type
Pollutants An
Manage Input
Strategies
Output
General
Output
Advanced Pe

Masterloopable Components

Component	Don't Execute	Save Data
Total Activity Generator (TAG)	<input type="checkbox"/>	<input type="checkbox"/>
Operating Mode Distribution Generator (running OMDG)	<input type="checkbox"/>	<input type="checkbox"/>
Start Operating Mode Distribution Generator	<input type="checkbox"/>	<input type="checkbox"/>
Average Speed Operating Mode Distribution Generator	<input type="checkbox"/>	<input type="checkbox"/>
Source Bin Distribution Generator (SBDG)	<input type="checkbox"/>	<input type="checkbox"/>
Meteorology Generator	<input type="checkbox"/>	<input type="checkbox"/>
Tank Temperature Generator	<input type="checkbox"/>	<input type="checkbox"/>
Tank Fuel Generator	<input type="checkbox"/>	<input type="checkbox"/>
Lookup Total Activity Generator	<input type="checkbox"/>	<input type="checkbox"/>
Lookup Operating Mode Distribution Generator	<input type="checkbox"/>	<input type="checkbox"/>
Emission Calculators	<input type="checkbox"/>	<input type="checkbox"/>
On-Road Retrofit	<input type="checkbox"/>	<input type="checkbox"/>
Project-Domain Total Activity Generator	<input type="checkbox"/>	<input type="checkbox"/>
Project-Domain Operating Mode Distribution Generator (running exhaust)	<input type="checkbox"/>	<input type="checkbox"/>

Select components and their execution options

Destination User Dataset

☐ Copy Saved Generator Data

Server:

Database: Create Database Refresh

Aggregation and Data Handling

☐ Do Not Perform Final Aggregation

Custom Input Database

Server:

Load File:

start Ed Glove... for Gary ... 2 Micro... C:\ Comman... MOVES -... 10:14 AM

MOVES

MOVES - ID 31809



File Edit Pre Processing Action Post Processing Settings Help

Click to enter database name

✓ Description

✓ Scale

✓ Time Spans

! Geographic B

[-] ✓ Vehicles/Equip

✓ On Road

✓ Road Type

✓ Pollutants And

≈ Manage Input

[+] ✓ Strategies

[-] ✓ Output

✓ General

✓ Output F

Region:

☐ Nation

☐ State

☒ County

☐ Zone & Link

☐ Custom Domain

States:

KANSAS
KENTUCKY
LOUISIANA
MAINE
MARYLAND
MASSACHUSETTS
MICHIGAN
MINNESOTA
MISSISSIPPI

Counties:

Selections

MICHIGAN

Select All

And

Domain Input Database

The Project domain scale requires a database of detailed data.

Server:

Database:

Enter/Edit Data

Refresh

Geographic Bounds Requirements

Please select a domain database.

start

2 Windows E...

Project Level 2...

Command Pro...

MOVES - ID 31...

3:08 PM



MOVES

MOVES - C:\Eds C Files\ReasonGroup Tasks\Task904\for Gary Dolce\Project Level HD Example.mrs - ID 33001

File Edit **Pre Processing** Action Post Processing Tools Settings Help

Execute Data Importer...
 Display/Edit IM Program Coverage Records
 Data Importer
 County Data Manager
 Project Start Project Domain Manager GUI Alt-P

Geographic B
 Vehicles/Equ
 On Road
 Road Type
 Pollutants An
 Manage Input
 Strategies
 Output
 General

Component	Don't Execute	Save Data
G)	<input type="checkbox"/>	<input type="checkbox"/>
n Generator (running OMDG)	<input type="checkbox"/>	<input type="checkbox"/>
tribution Generator	<input type="checkbox"/>	<input type="checkbox"/>
Average Speed Operating Mode Distribution Generator	<input type="checkbox"/>	<input type="checkbox"/>
Source Bin Distribution Generator (SBDG)	<input type="checkbox"/>	<input type="checkbox"/>
Meteorology Generator	<input type="checkbox"/>	<input type="checkbox"/>
Tank Temperature Generator	<input type="checkbox"/>	<input type="checkbox"/>
Tank Fuel Generator	<input type="checkbox"/>	<input type="checkbox"/>
Lookup Total Activity Generator	<input type="checkbox"/>	<input type="checkbox"/>
Lookup Operating Mode Distribution Generator	<input type="checkbox"/>	<input type="checkbox"/>
Emission Calculators	<input type="checkbox"/>	<input type="checkbox"/>
On-Road Retrofit	<input type="checkbox"/>	<input type="checkbox"/>
Project-Domain Total Activity Generator	<input type="checkbox"/>	<input type="checkbox"/>
Project-Domain Operating Mode Distribution Generator (running exhaust)	<input type="checkbox"/>	<input type="checkbox"/>

Destination User Dataset

☐ Copy Saved Generator Data

Server:

Database: Create Database Refresh

Aggregation and Data Handling

☐ Do Not Perform Final Aggregation

Custom Input Database

Server:

Select and Import Project-Level Data

start Ed Glove... for Gary ... 2 Micro... C:\ Comman... MOVES - ... 10:19 AM



Creating a Project Database

MOVES



MOVES

MOVES Project Data Manager

Operating Mode Distribution Age Distribution Fuel Supply Meteorology Data Tools I/M
RunSpec Summary Database Links Link Source Types Link Drive Schedules Off-Network

Select or create a database to hold the imported data.

Server: localhost

Database: hdprojectexampleinput Create Database Refresh

Log:

Enter Database Name

Click to Create Database

Database

Done

start Ed Glover... For Gary ... 2 Micros... Command... MOVES - ... 10:44 AM

Project Database Tab

- **Create a Project Level Database**

- Project level database will contain all of the user data for use by MOVES. During execution, MOVES does not ‘read’ data from Excel spreadsheets, but imports the data into a project level database.
- Server is usually ‘localhost’
- Refresh button updates the list of databases
- Create Database creates a new project level database

- **“Done” button**

- This button merely closes the project level input GUI.



MOVES Project Data Manager

☒ Operating Mode Distribution
 ☒ Age Distribution
 ☒ Fuel Supply
 ☒ Meteorology Data
 Tools
 I/M

☒ RunSpec Summary
 Database
 ☒ Links
 ☒ Link Source Types
 ☒ Link Drive Schedules
 ☒ Off-Network

Output Database Name: hdprojectoutput

Time Spans:

Aggregate By: Hour

Years: 2009

Months: January

Days: Weekdays

Hours: Begin Hour: 23:00 - 23:59
End Hour: 23:00 - 23:59

Geographic Bounds:

LINK geography
Selection: MICHIGAN - Washtenaw County

On Road Vehicle Equipment:
Diesel Fuel - Combination Long-haul Truck

Road Types:
Off-Network
Rural Unrestricted Access

RunSpec Summary

Done

Select and Import Project-Level Data



MOVES

MOVES Project Data Manager

☒ Operating Mode Distribution ☒ Age Distribution ☒ Fuel Supply ☒ Meteorology Data ☐ Tools ☐ IM

☒ RunSpec Summary ☒ Database ☒ Links ☒ Link Source Types ☒ Link Drive Schedules ☒ Off-Network

January

Days: Weekdays

Hours: Begin Hour: 23:00 - 23:59
End Hour: 23:00 - 23:59

Geographic Bounds:
LINK geography
Selection: MICHIGAN - Washtenaw County

On Road Vehicle Equipment:
Diesel Fuel - Combination Long-haul Truck

Road Types:
Off-Network
Rural Unrestricted Access

Pollutants And Processes:
Running Exhaust Oxides of Nitrogen
Start Exhaust Oxides of Nitrogen
Extended Idle Exhaust Oxides of Nitrogen

Manage Input Data Sets:

RunSpec Summary

Done



Runspec Tabs

- **Runspec tab**

- Echos a summary of the runspec
 - Time
 - Geography
 - Vehicle types
 - Road types
 - Pollutants
 - Additional User Databases
- Be careful of Runspec changes after you create a Project Database



Operating Mode & Drive Schedule Data

MOVES



Opmode & Driving Schedule Two Tabs

- **Operating Mode and Driving Schedule Tabs have Interactions**
 - Operating mode distribution input is required for the ...
 - Start process
 - Extended idle process
 - Running process where no drive schedule is supplied
 - Drive Schedule Input is optional and used only for roadway links and the 'running' process.



MOVES

MOVES Project Data Manager

Operating Mode Distribution (X) Age Distribution (X) Fuel Supply (X) Meteorology Data (X) Tools IM
RunSpec Summary Database (X) Links (X) Link Source Types (X) Link Drive Schedules (✓) Off-Network (X)

Description of Imported Data:

opModeDistribution Data Source:

File: (please select a file)

Browse...
Create Template...
Import

Messages:

Export Most Recent Execution Data Export Imported Data Clear Imported Data

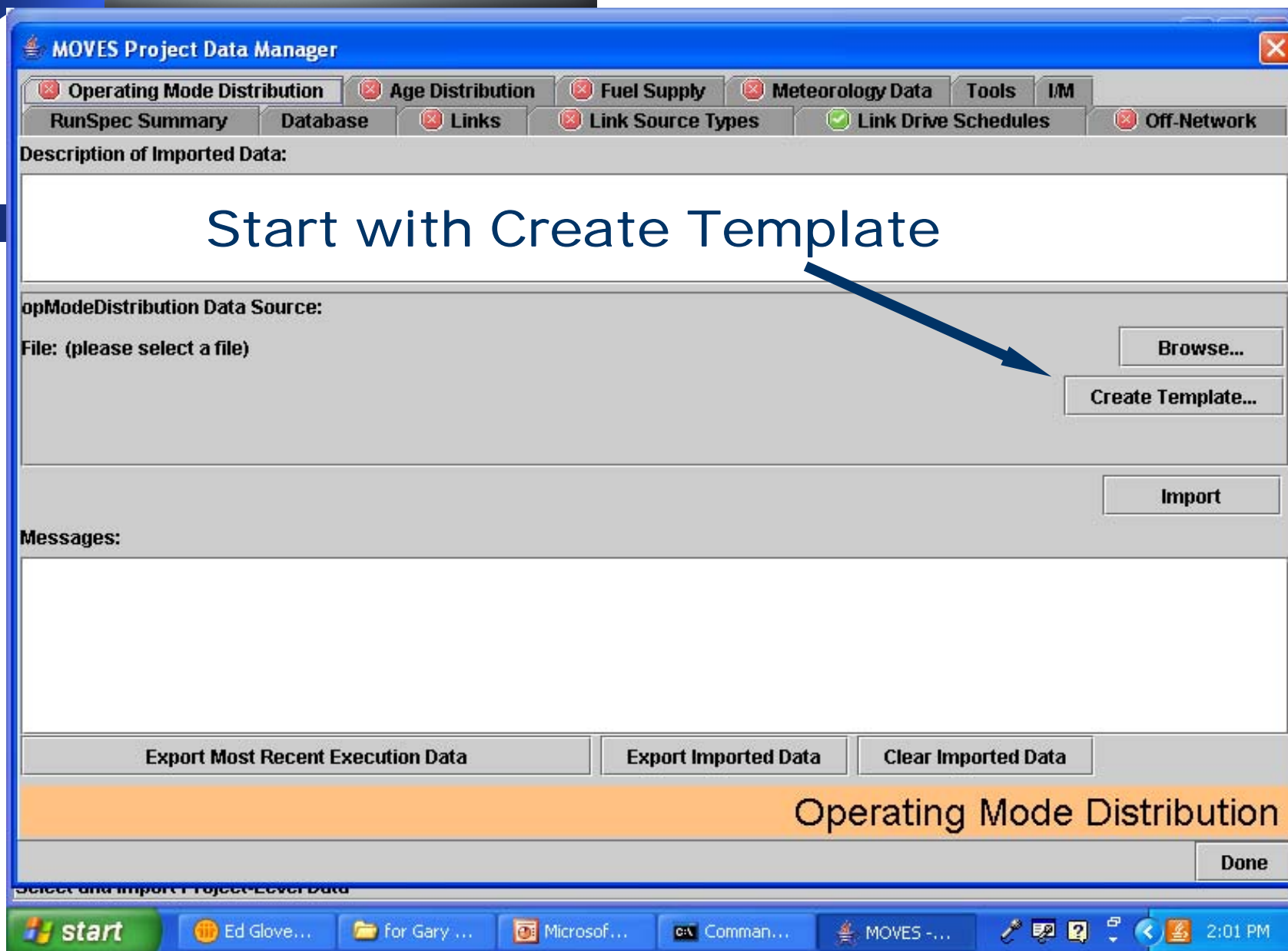
Operating Mode Distribution

Done

Operating Mode Distribution



MOVES



Project Level Templates

- Template button creates an Excel Workbook
- First tab (starting from the left) in the Workbook is where the user supplied data are entered. This is the 'active' worksheet.
- Remaining tabs define the required fields as an assistance to the user.
- It is recommended that the user utilize the Template function in the initial set-up of the project. However, after the project is established, 'active' worksheets may be collapsed into a single workbook.



Operating Mode Distribution Data

- **Inputs must be supplied for each ...**
 - Source Type
 - Hour / Day Combination
 - Project Link
 - Pollutant Process Combination
 - Operating Mode
- **Must sum to unity within a group**
- **Operating mode definitions vary by process**
 - 23 operating modes for running
 - 8 operating modes for start
 - 1 operating mode for extended idle
 - 16 operating modes for tire / brake process



MOVES

Microsoft Excel - OperatingModeDistribution.xls

Type a question for help

File Edit View Insert Format Tools Data Window Help

Draw AutoShapes

Ready NUM

2:07 PM

	A	B	C	D	E	F	G	H	I	J	K	L
1	sourceTyp	hourDayID	linkID	polProcess	opModeID	opModeFraction						
2	62	245		301	0							
3	62	245		301	1							
4	62	245		301	11							
5	62	245		301	12							
6	62	245		301	13							
7	62	245		301	14							
8	62	245		301	15							
9	62	245		301	16							
10	62	245		301	21							
11	62	245		301	22							
12	62	245		301	23							
13	62	245		301	24							
14	62	245		301	25							
15	62	245		301	26							
16	62	245		301	27							
17	62	245		301	28							
18	62	245		301	29							
19	62	245		301	30							
20	62	245		301	33							
21	62	245		301	35							
22	62	245		301	36							

Enter Link and opMode Fractions

Roadway Link

Microsoft Excel - opModeDistribution.xls

Type a question for help

10 B I U

F11 0.02187

	A	B	C	D	E	F	G	H	I
	sourceTypeID	hourDayID	linkID	polProcessID	opModeID	opModeFraction			
2	21	145	1	9101	0	0.12747			
3	21	145	1	9101	1	0.1872			
4	21	145	1	9101	11	0.0112			
5	21	145	1	9101	12	0.0496			
6	21	145	1	9101	13	0.05973			
7	21	145	1	9101	14	0.05813			
8	21	145	1	9101	15	0.04853			
9	21	145	1	9101	16	0.0576			
10	21	145	1	9101	21	0.008			
11	21	145	1	9101	22	0.02187			
12	21	145	1	9101	23	0.04213			
13	21	145	1	9101	24	0.06133			
14	21	145	1	9101	25	0.06133			
15	21	145	1	9101	27	0.08533			
16	21	145	1	9101	28	0.02773			
17	21	145	1	9101	29	0.00747			
18	21	145	1	9101	30	0.00427			
19	21	145	1	9101	33	0.00373			
20	21	145	1	9101	35	0.0144			
21	21	145	1	9101	37	0.01387			
22	21	145	1	9101	38	0.01973			

opModeDistribution / HourDay / OperatingMode / PollutantProce

Ready NUM

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 3:45 PM

MOVES

Off-Network Start Link

Microsoft Excel - ProjectWES.xls

File Edit View Insert Format Tools on the Ribbon Help

Formulas: =

Home Insert Layout References Tools on the Ribbon

Formulas: =

Ready NUM

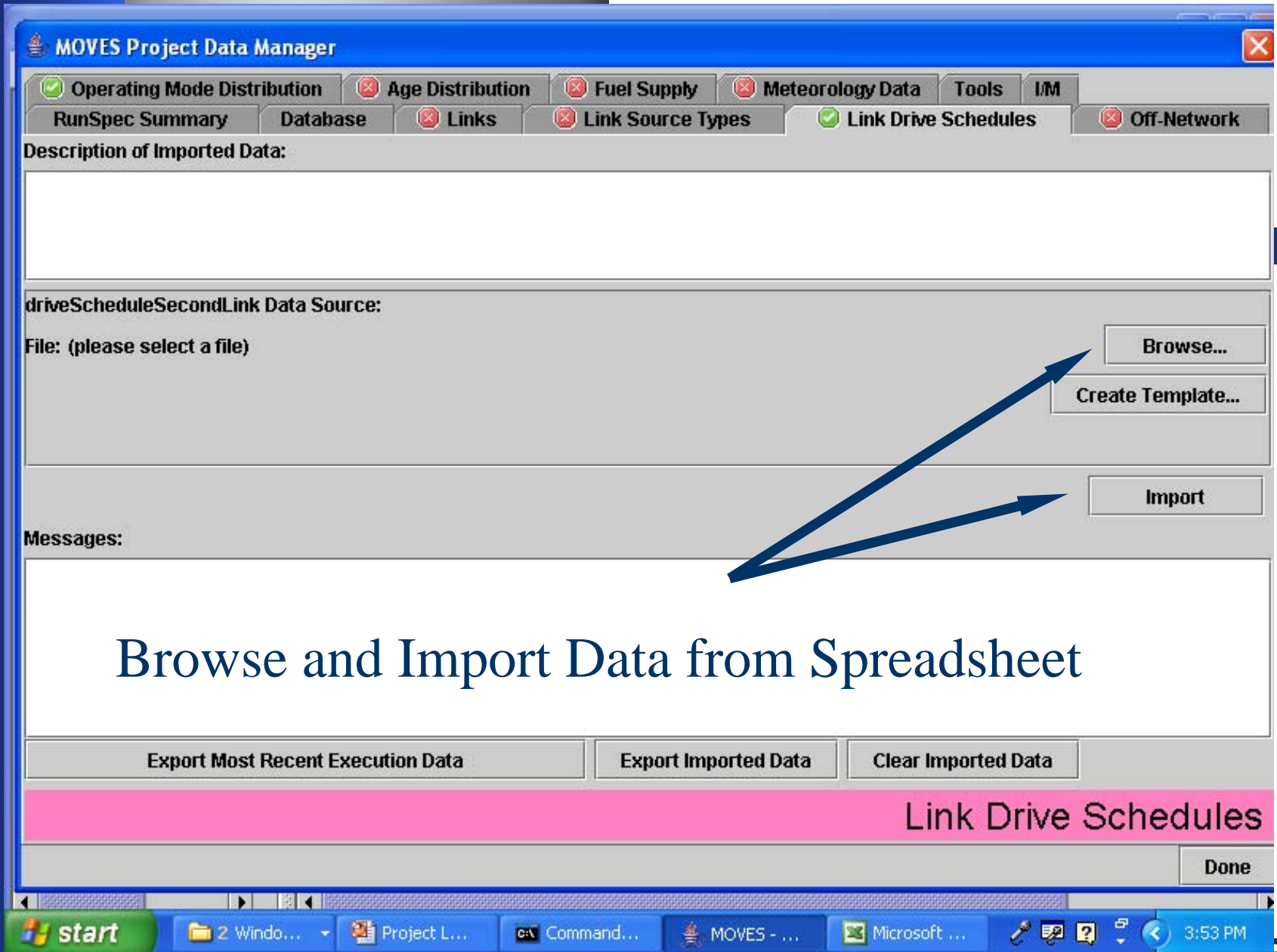
	A	B	C	D	E	F	G	H	I	J	K	L
1	sourceTyp	hourDayID	linkID	polProcess	opModelID	opModeFraction						
2	62	245	3	302	101	0						
3	62	245	3	302	102	0.05						
4	62	245	3	302	103	0.3						
5	62	245	3	302	104	0.1						
6	62	245	3	302	105	0.5						
7	62	245	3	302	106	0						
8	62	245	3	302	107	0						
9	62	245	3	302	108	0.05						
10	62	245	3	390	200	1						
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												

meteorology opmodedistributionStart opmodedistribution

Draw AutoShapes

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 3:48 PM

MOVES



Browse and Import Data from Spreadsheet



Link Drive Schedule Rules

- Link Drive Schedules is an optional input for roadway links only.
- MOVES converts drive schedule data into operating mode distributions
- Default data are not available
- User supplies speed / time / percent grade data for each second for each link
- If data for one roadway link is supplied then data for ALL roadway links must be supplied
- Operating Mode Distribution data will over-ride Link Drive Schedule data if both are present



MOVES

Microsoft Excel - Project Level HD Example.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial

10 B I U

D12

= 1

	A	B	C	D	E	F	G	H	I	J	K	L
1	linkID	secondID	speed	grade								
2	1	1	30	1								
3	1	2	30	1								
4	1	3	30	1								
5	1	4	30	1								
6	1	5	30	1								
7	1	6	30	1								
8	1	7	30	1								
9	1	8	30	1								
10	1	9	30	1								
11	1	10	30	1								
12	1	11	30	1								
13	1	12	30	1								
14	1	13	30	1								
15	1	14	30	1								
16	1	15	30	1								
17	1	16	30	1								
18	1	17	30	1								
19	1	18	30	1								
20	1	19	30	1								
21	1	20	30	1								
22	1	21	30	1								

meteorology \ driveScheduleSecondLink \ linksourcetypehour \ f

Ready

NUM

start

Ed Gl...

for G...

Micro...

C:\ Com...

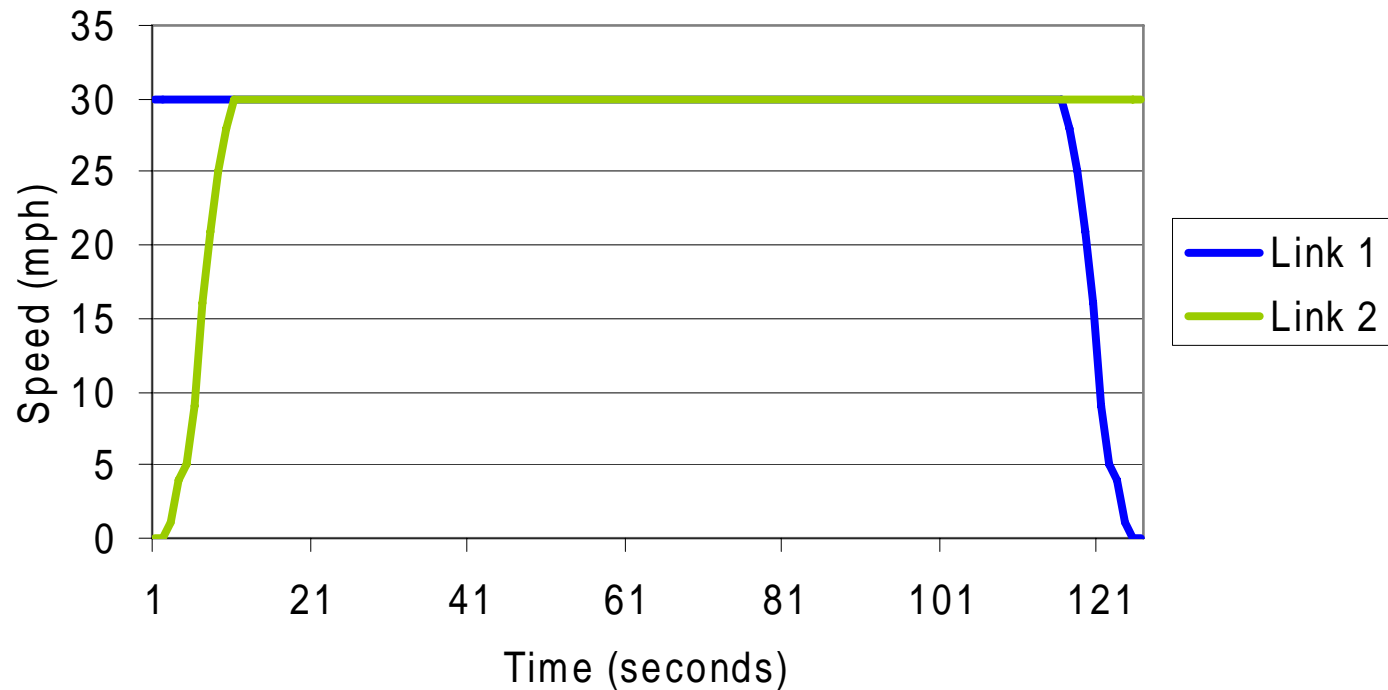
MOV...

2 Mi...

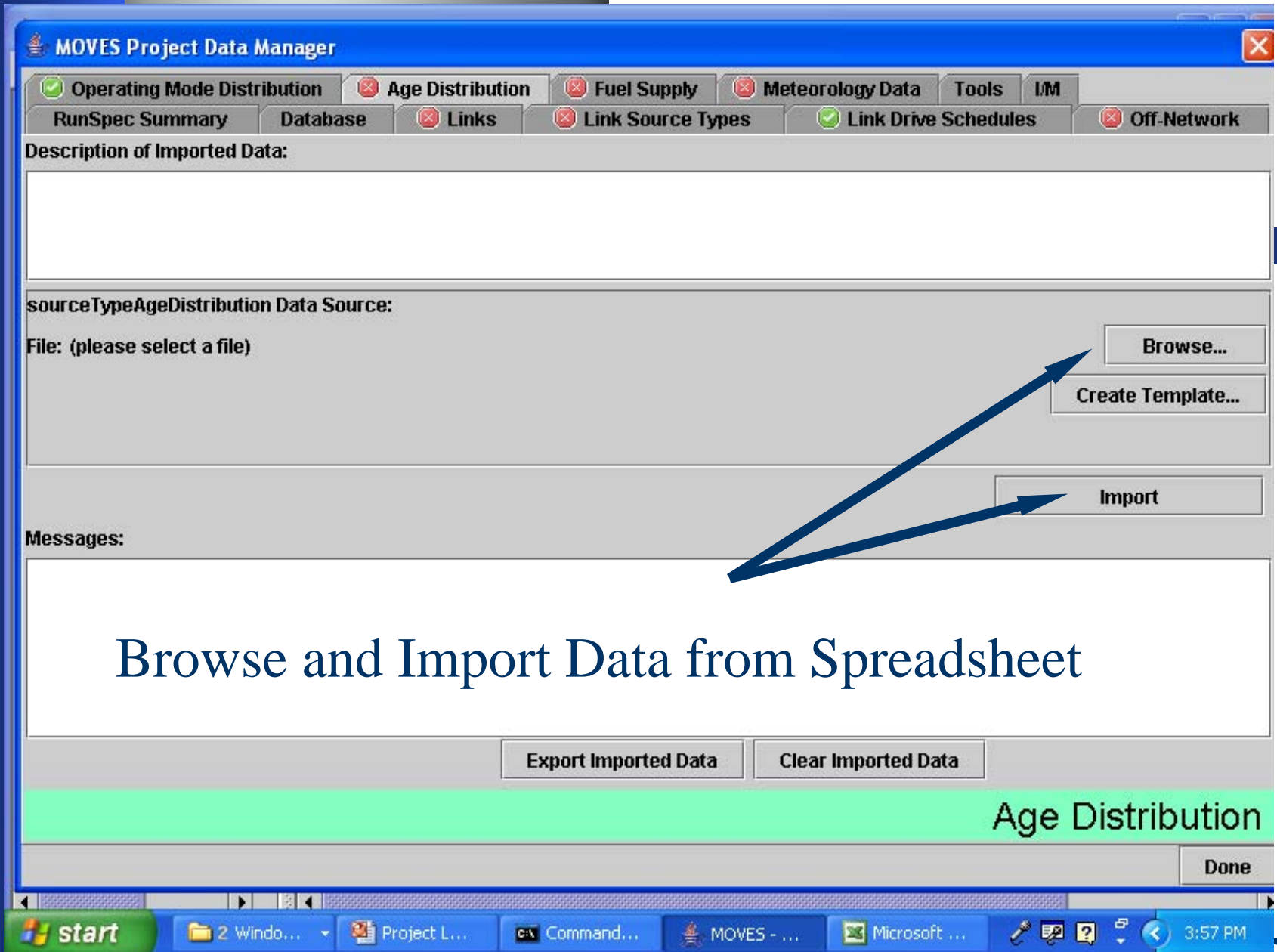
2:28 PM

Speed / Time Trace for Example Links

Speed / Time Trace for Example Links



MOVES



Browse and Import Data from Spreadsheet



MOVES

Microsoft Excel - ProjectWES.xls

Type a question for help

File Edit View Insert Format Tools Data Window Help

Draw AutoShapes

Ready Insert WordArt NUM

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 3:58 PM

	A	B	C	D	E	F	G	H	I	J	K	L
1	sourceType	yearID	ageID	ageFraction								
2	62	2009	0	0.2								
3	62	2009	1	0.15								
4	62	2009	2	0.1								
5	62	2009	3	0.1								
6	62	2009	4	0.1								
7	62	2009	5	0.07								
8	62	2009	6	0.05								
9	62	2009	7	0.05								
10	62	2009	8	0.05								
11	62	2009	9	0.02								
12	62	2009	10	0.02								
13	62	2009	11	0.01								
14	62	2009	12	0.01								
15	62	2009	13	0.01								
16	62	2009	14	0.01								
17	62	2009	15	0.01								
18	62	2009	16	0.01								
19	62	2009	17	0.01								
20	62	2009	18	0.01								
21	62	2009	19	0.01								
22	62	2009	20	0								

linksourcetypehour / offNetwork / sourcetypeagedistribution

Age Fractions sum to unity
for each Source Type
30 MYs must be entered



MOVES

MOVES Project Data Manager

Operating Mode Distribution ☒ Age Distribution ☒ Fuel Supply ☒ Meteorology Data ☒ Tools I/M

RunSpec Summary Database Links ☒ Link Source Types ☒ Link Drive Schedules ☒ Off-Network ☒

Description of Imported Data:

Export Default Data First !

FuelSupply Data Source:
File: (please select a file)

Browse...
Create Template...
Import

Messages:

Browse and Import Previously Exported Data

Export Default Data Export Imported Data Clear Imported Data

Fuel Supply

Done

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 4:01 PM



MOVES

Microsoft Excel - ProjectWES.xls

Type a question for help

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U

118 fx

	A	B	C	D	E	F	G	H	I	J	K	L
1	countyID	fuelYearID	monthGroup	fuelFormul	marketShare	marketShareCV						
2	26161	2009	1	868	1	0						
3	26161	2009	1	3043	1	0						
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												

Project Level Allows / Recommends the Use of Default Fuel Data

driveSchedule fuelSupply links linksource type hour offNetwork

Draw AutoShapes

Ready NUM

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 4:05 PM



MOVES

MOVES Project Data Manager

Operating Mode Distribution ☒ Age Distribution ☒ Fuel Supply ☒ Meteorology Data ☒ Tools I/M

RunSpec Summary Database ☒ Links ☒ Link Source Types ☒ Link Drive Schedules ☒ Off-Network ☒

Description of Imported Data:

Export Default Data First !

zoneMonthHour Data Source:

File: (please select a file)

Browse...
Create Template...

Import

Messages:

Browse and Import Previously Exported Data

Export Default Data Export Imported Data Clear Imported Data

Meteorology Data

Done

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 4:07 PM

Microsoft Excel - ProjectWES.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10 B I U

C6 fx

	A	B	C	D	E	F	G	H	I	J	K	L
1	monthID	zoneID	hourID	temperature	relHumidity							
2	1	261610	24	28.5	69.5							
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
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19												
20												
21												
22												

Change Default Temperature / Humidity Data to Local Data

meteorology / opmodedistributionStart / opmodedistribution /

Draw AutoShapes

Ready NUM

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 4:09 PM



MOVES

MOVES Project Data Manager

☒ Operating Mode Distribution

☒ Age Distribution

☒ Fuel Supply

☒ Meteorology Data

Tools

I/M

RunSpec Summary

Database

☒ Links

☒ Link Source Types

☒ Link Drive Schedules

☒ Off-Network

Description of Imported Data:

link Data Source:

File: (please select a file)

Browse...

Create Template...

Import

Messages:

Export Most Recent Execution Data

Export Imported Data

Clear Imported Data

Links

Done

start

2 Windo...

Project L...

Command...

MOVES - ...

Microsoft ...

4:11 PM



Link Inputs

- LinkID
- CountyID
- ZoneID
- RoadTypeID
- Link Length
- Link Volume
- Link Average Speed
- Link Description
- Each link in Project must be entered
- ZoneID has a zero at the end
- Each link is associated with a MOVES roadtype
- Link Length is in MILES
- Link Volume is total traffic volume in one hour
- Link Average Speed is in miles per hour
- Link Description is a non executing text field



MOVES

Microsoft Excel - Project Level HD Example.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10 B I U

	A	B	C	D	E	F	G	H	I	J
1	linkID	countyID	zoneID	roadTypeID	linkLength	linkVolume	linkAvgSpeed	linkDescription		
2	1	26161	261610	3	0.998	100	28.5	Inbound link		
3	2	26161	261610	3	0.998	10	28.5	outbound link		
4	3	26161	261610	1	0	0	0	offnetwork link		
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

fuelsupply / sourcetypeagedistribution / links / OffNetworkLink

Draw AutoShapes

Ready NUM

start Ed Glo... for Ga... Micros... C:\ Comm... MOVE... 2 Mi... 3:28 PM

MOVES

MOVES Project Data Manager

☒ Operating Mode Distribution

☒ Age Distribution

☒ Fuel Supply

☒ Meteorology Data

Tools

I/M

RunSpec Summary

Database

☒ Links

☒ Link Source Types

☒ Link Drive Schedules

☒ Off-Network

Description of Imported Data:

linkSourceTypeHour Data Source:

File: (please select a file)

Browse...

Create Template...

Import

Messages:

Export Most Recent Execution Data

Export Imported Data

Clear Imported Data

Link Source Types

Done



start

2 Windo...

Project L...

Command...

MOVES - ...

Microsoft ...

4:13 PM

MOVES

Microsoft Excel - ProjectWES.xls

Type a question for help

File Edit View Insert Format Tools Data Window Help

Draw AutoShapes

Ready NUM

start 2 Windo... Project L... Command... MOVES - ... Microsoft ... 4:14 PM

	A	B	C	D	E	F	G	H	I	J	K
1	linkID	sourceTyp	sourceTypeHourFraction								
2	1	62	0.7								
3	2	62	1								
4	3	62	1								
5	1	21	0.3								
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											

Source Type Distribution for Each Link

links linksourcetypehour offNetwork sourcetypeagedistributio

MOVES

MOVES Project Data Manager

☒ Operating Mode Distribution

☒ Age Distribution

☒ Fuel Supply

☒ Meteorology Data

Tools

I/M

RunSpec Summary

Database

☒ Links

☒ Link Source Types

☒ Link Drive Schedules

☒ Off-Network

Description of Imported Data:

offNetworkLink Data Source:

File: (please select a file)

Browse...

Create Template...

Import

Messages:

Export Most Recent Execution Data

Export Imported Data

Clear Imported Data

Off-Network

Done



start

2 Windo...

Project L...

Command...

MOVES - ...

Microsoft ...

4:16 PM

Off-Network Tab

- **Source Type**
- **Vehicle Population**
 - Average number of off-network vehicles
- **Start Fraction**
 - Average fraction of the population which has been started during the hour (may be greater than unity if the average vehicle is started more than once per hour)
- **Extended Idle Fraction**
 - Only used for long-haul diesel trucks (0 – 1.0 range)
- **Parked Vehicle Fraction**
 - Only used for Evaporative, and is currently inactive.



MOVES

Microsoft Excel - Project Level HD Example.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10 B I U

	A	B	C	D	E	F	G	H
1	sourceTypeID	vehiclePopulation	startFraction	extendedIdleFraction	parkedVehicleFraction			
2	62	200	0.03	0.9	0.09			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Ready

NUM

start Ed Glo... For Ga... Micros... C:\ Comm... MOVE... 2 Mi... 4:00 PM



Project GUI Buttons

- **Export Default Data**
 - Fuel Supply and Meteorology tabs only
- **Export Most Recent Execution Data**
 - Exports results from a previous MOVES run
 - MOVES Execution Data must exist
 - Exports to an Excel Spreadsheet
 - Might be useful for building additional project level inputs
- **Export Imported Data**
 - Exports data contained in the project level database back to an Excel Spreadsheet
 - Useful for checking data / debugging



MOVES



MOVES Project Data Manager



☒ Operating Mode Distribution

☒ Age Distribution

☒ Fuel Supply

☒ Meteorology Data

Tools

I/M

RunSpec Summary

Database

☒ Links

☒ Link Source Types

☒ Link Drive Schedules

☒ Off-Network

Description of Imported Data:

linkSourceTypeHour Data Source:

File: ProjectWES.xls

XLS, linksourcetypehour

Browse...

Create Template...

Import

Messages:

Import complete.

Export Most Recent Execution Data

Export Imported Data

Clear Imported Data

Link Source Types

Done



start

2 Windo...

Project L...

Command...

MOVES - ...

Microsoft ...

4:25 PM

Project GUI Buttons (con't)

- **Clear Imported Data**

- Wipes out data from the project level database for a selected tab.
- Allows the user to get rid of selected data in their project level database.
- Use this button if ...
 - The inputs for a particular table have changed. Wipe out the old table before IMPORTING the new table
 - The inputs for the Runspec have changed. Wipe out all of the project level tables before IMPORTING the new tables.

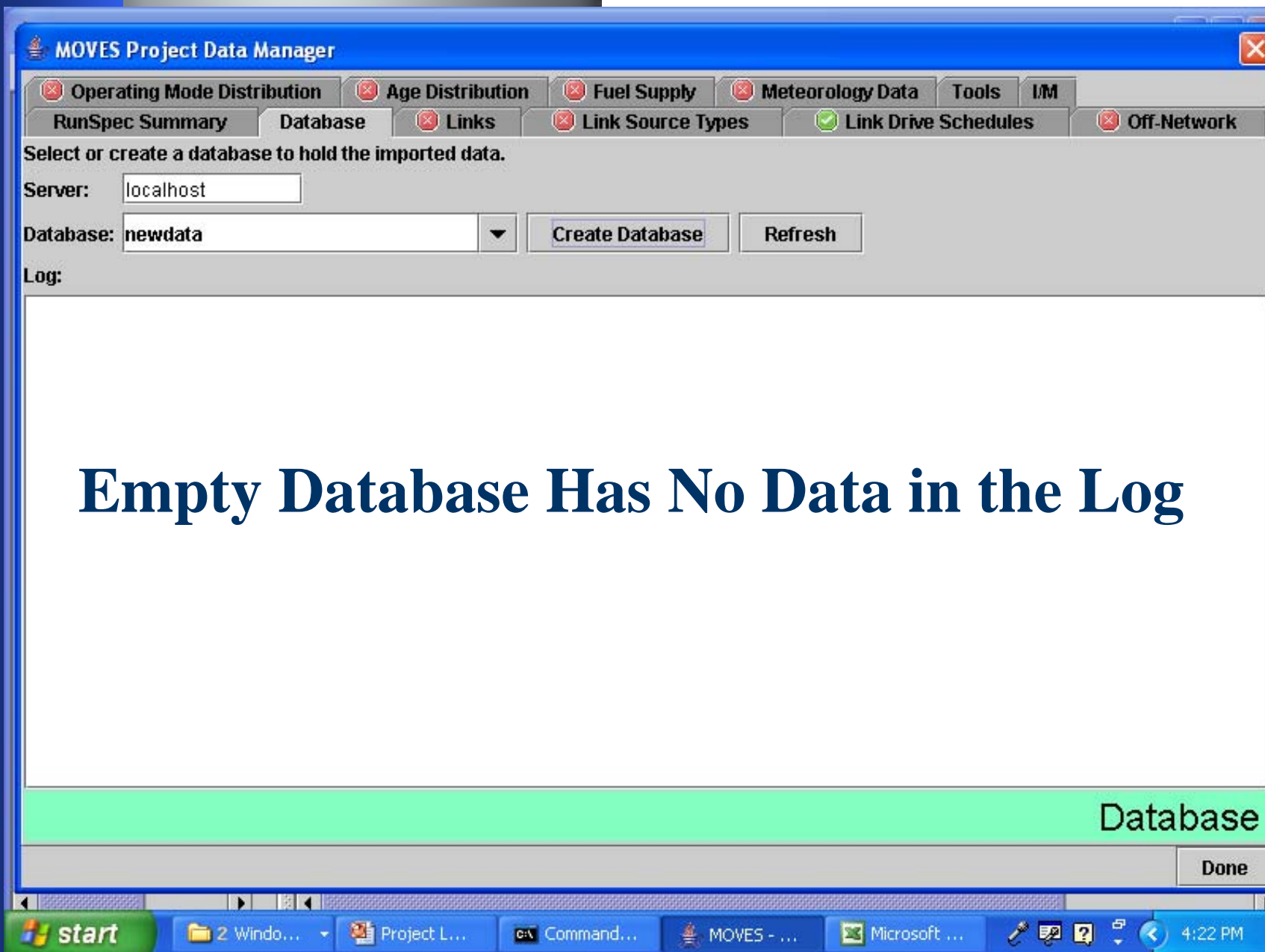


Database Tab

- **User Provides the Name of the Database in this GUI Window**
- **Provides a Log of the Project Level Data Import Activity**
 - Date
 - Time
 - Name of the Database Table



MOVES



Empty Database Has No Data in the Log

MOVES

MOVES Project Data Manager

☒ Operating Mode Distribution ☒ Age Distribution ☒ Fuel Supply ☒ Meteorology Data Tools I/M

☒ RunSpec Summary **Database** ☒ Links ☒ Link Source Types ☒ Link Drive Schedules ☒ Off-Network

Select or create a database to hold the imported data.

Server:

Database:

Log:

2009-03-30 13:18:01 Operating Mode Distribution Filled OpModeDistribution table
2009-03-30 11:50:55 Off-Network Filled OffNetworkLink table
2009-03-30 11:50:46 Link Drive Schedules Filled DriveScheduleSecondLink table
2009-03-30 11:50:37 Link Source Types Filled LinkSourceTypeHour table
2009-03-30 11:50:24 Links Filled Link table
2009-03-30 11:50:09 Meteorology Data Filled ZoneMonthHour table
2009-03-30 11:49:59 Fuel Supply Filled FuelSupply table
2009-03-30 11:49:46 Age Distribution Filled SourceTypeAgeDistribution table

Database

Done

Select and import Project-Level Data

start Ed ... Tas... Mic... Co... MO... 2 M... DR... 4:22 PM

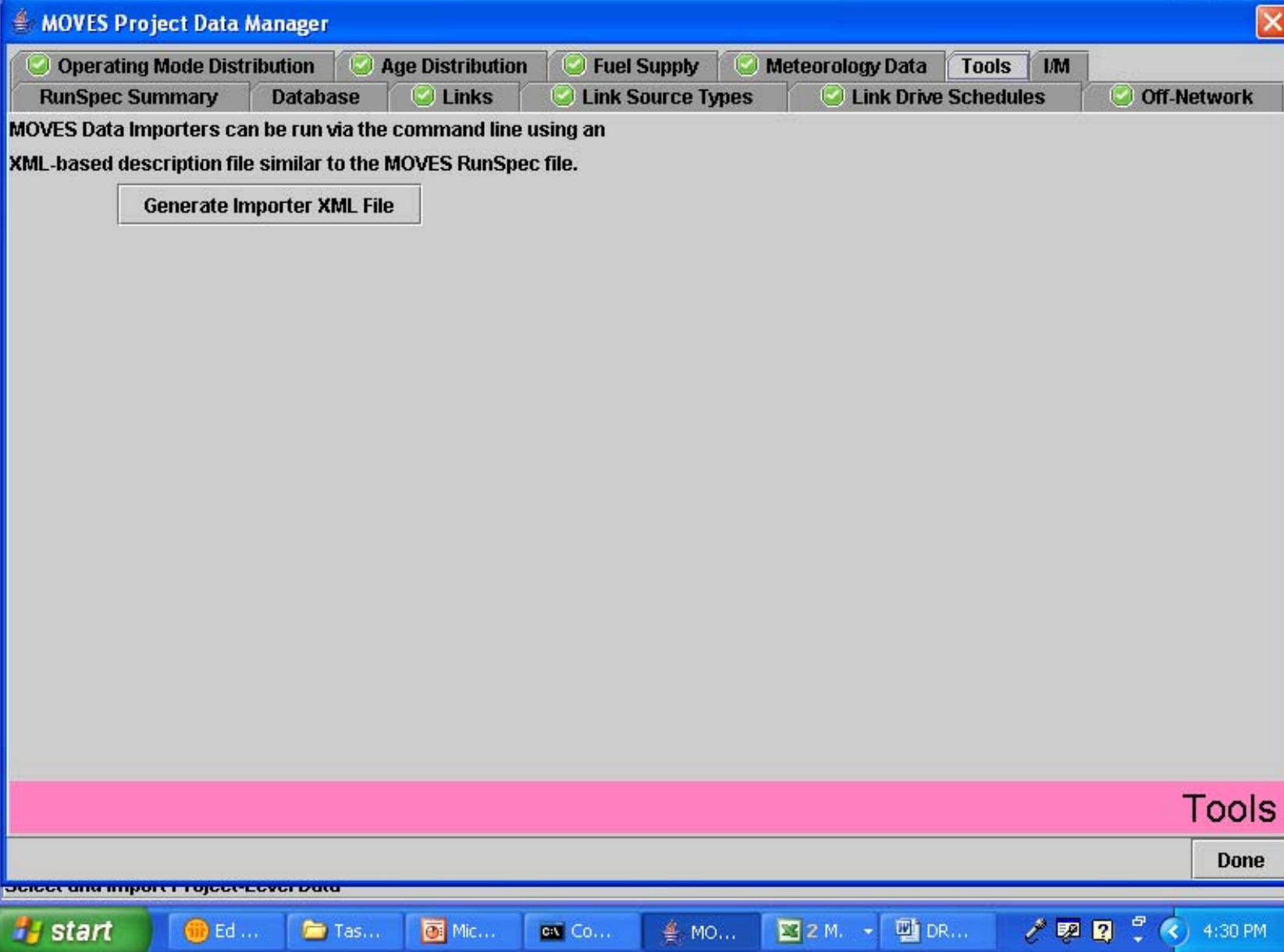


Tools tab

- **Generate Importer XML File**
 - Similar to a Runspec File (GUI inputs are represented as XML text)
 - XML file will contain a path/filename to the location of the spreadsheet data files. Actual data is not contained in the XML file.
 - Project Level Databases can be run using DOS command line scripts
- **Tools tab is not fully developed or supported.**



MOVES



Project Level Output

- Results are placed in the standard MOVESOutput table.
- LinkID is added to each record if road type is selected in the MOVES output GUI.
- User can obtains both emission inventory and VMT results for the specified time and location domain and



Issues / Suggestions

- Calculate both emission rate and inventory
- Develop library of driving cycle operating mode distributions
- Provide seamless interface between MOVES Project
 - Concept Model
 - Travel Demand Models
- Add evaporative emission calculation capability

