EMFAC-HK

Using the Program

Objectives

- Install EMFAC-HK v 2.1 software
- Step by step tutorial to demonstrate examples of emission data routinely run by EMFAC-HK
- Discuss EMFAC-HK 2.1 input/output screens
- Perform exercises using EMFAC-HK v 2.1

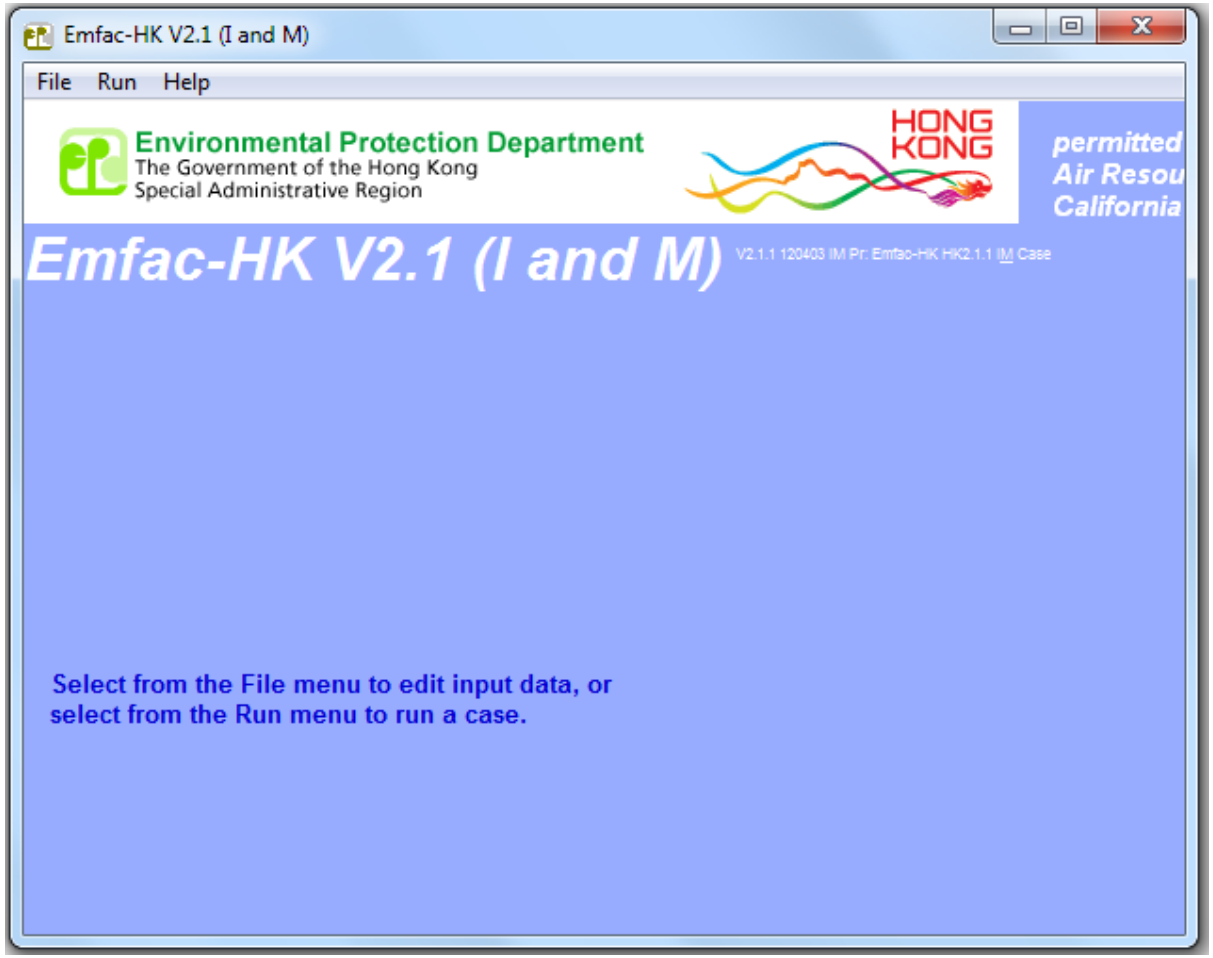
System Requirements / Installation

- **Executables** - *http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/emfac.html*
- **x86 compatible Microsoft 32-bit or 64-bit OS (preferably Microsoft Windows XP Service Pack 3, Windows Vista, or Windows 7 operating systems)**
- **45 MB of Hard Disk** space
- **Minimum** 64 MB RAM (128 MB recommended)
- **Available Hard Disk Space** 350 MB

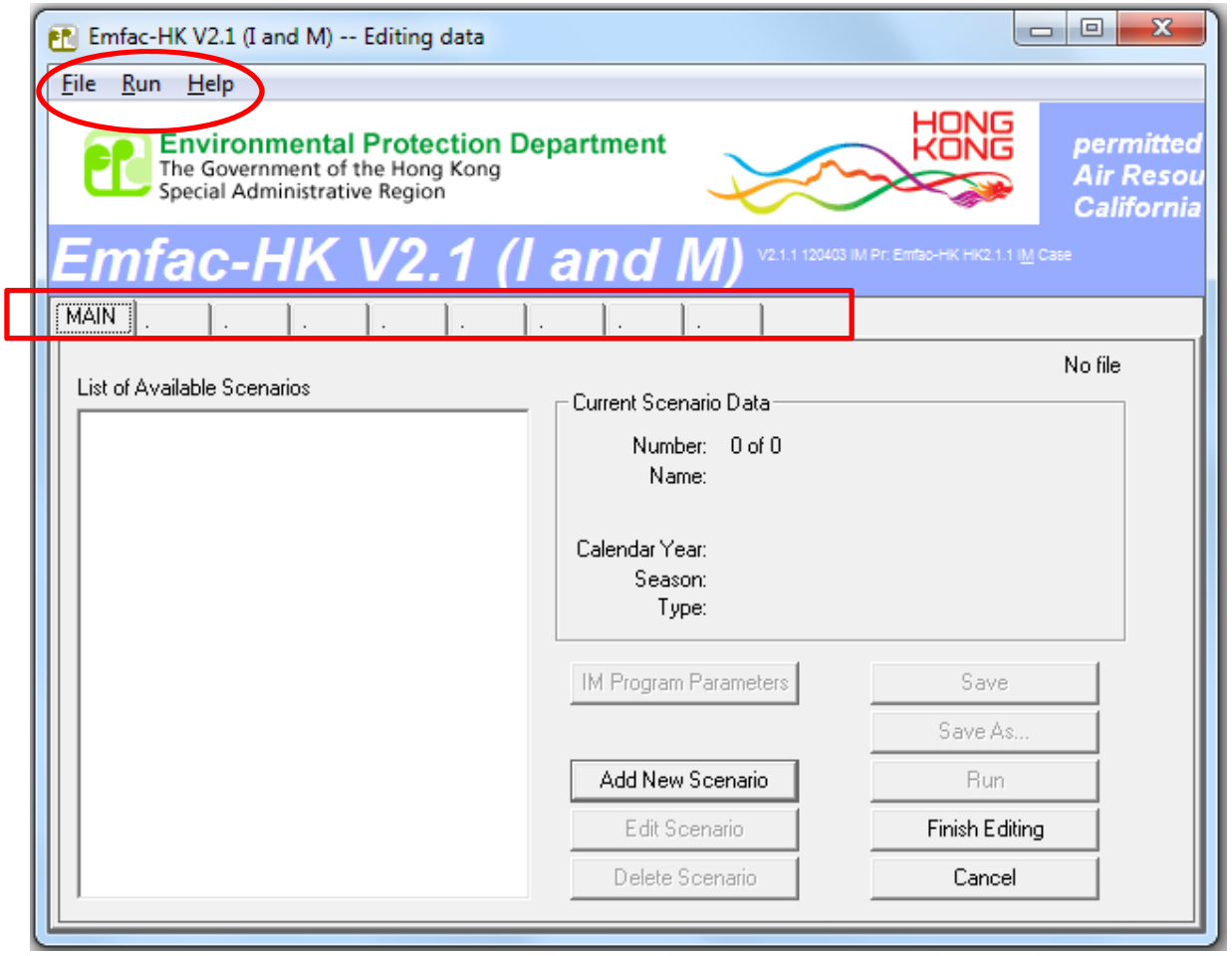
Installation

- Program:
  - EmfacHKV21BCInstaller.exe
    - Emfac_HK_v2.1 Base Case (BC) Installation Packet
    - Installs EmfacHKV2_1_BC.exe and supporting libraries in default, or user-specified directory
  - EmfacHKV21IMInstaller.exe
    - Emfac_HK_v2.1 Inspection & Maintenance (I&M) Installation Packet
    - Installs EmfacHKV2_1_I&M.exe and supporting libraries in default, or user-specified directory

Running the Program
Opening Screen

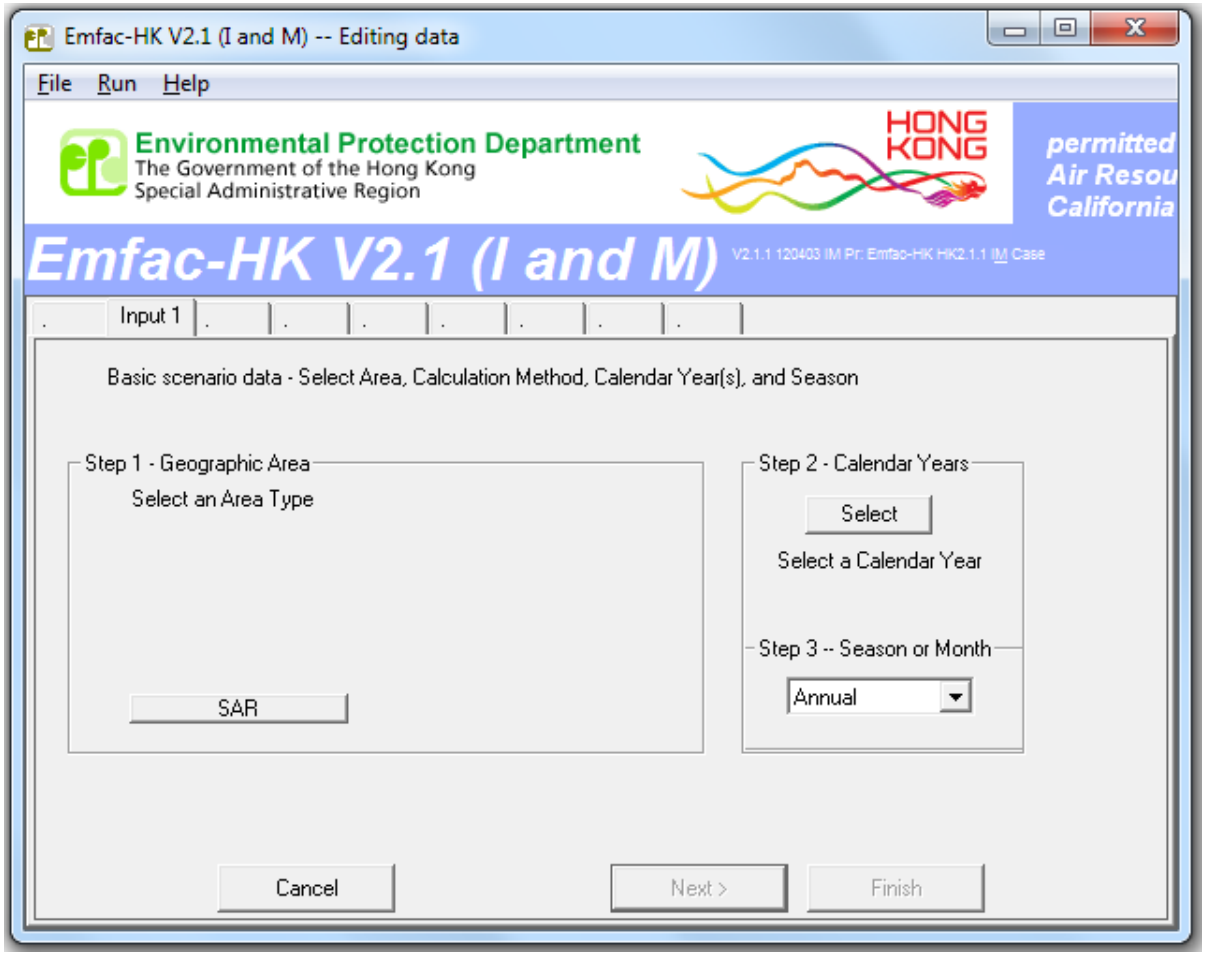


Main Screen

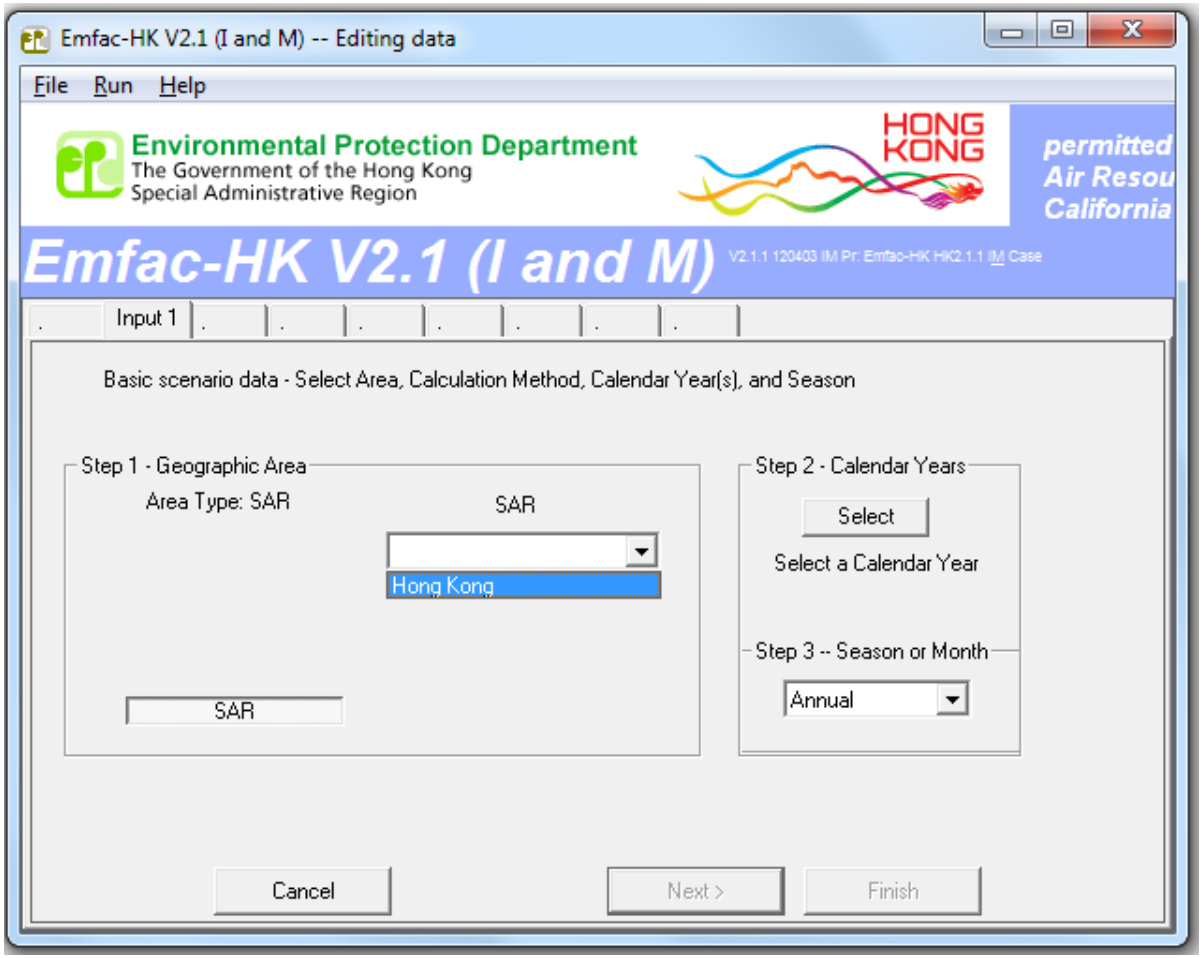


Tabs must be performed in sequence.

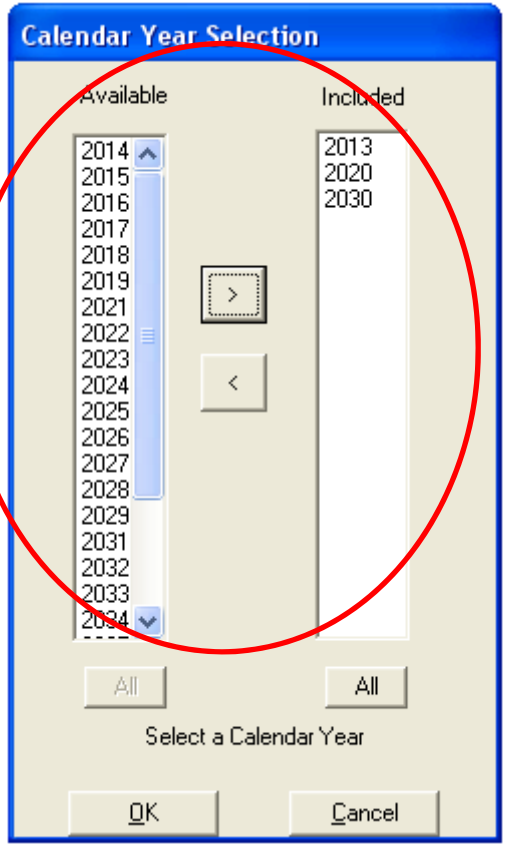
Adding or Editing Scenarios



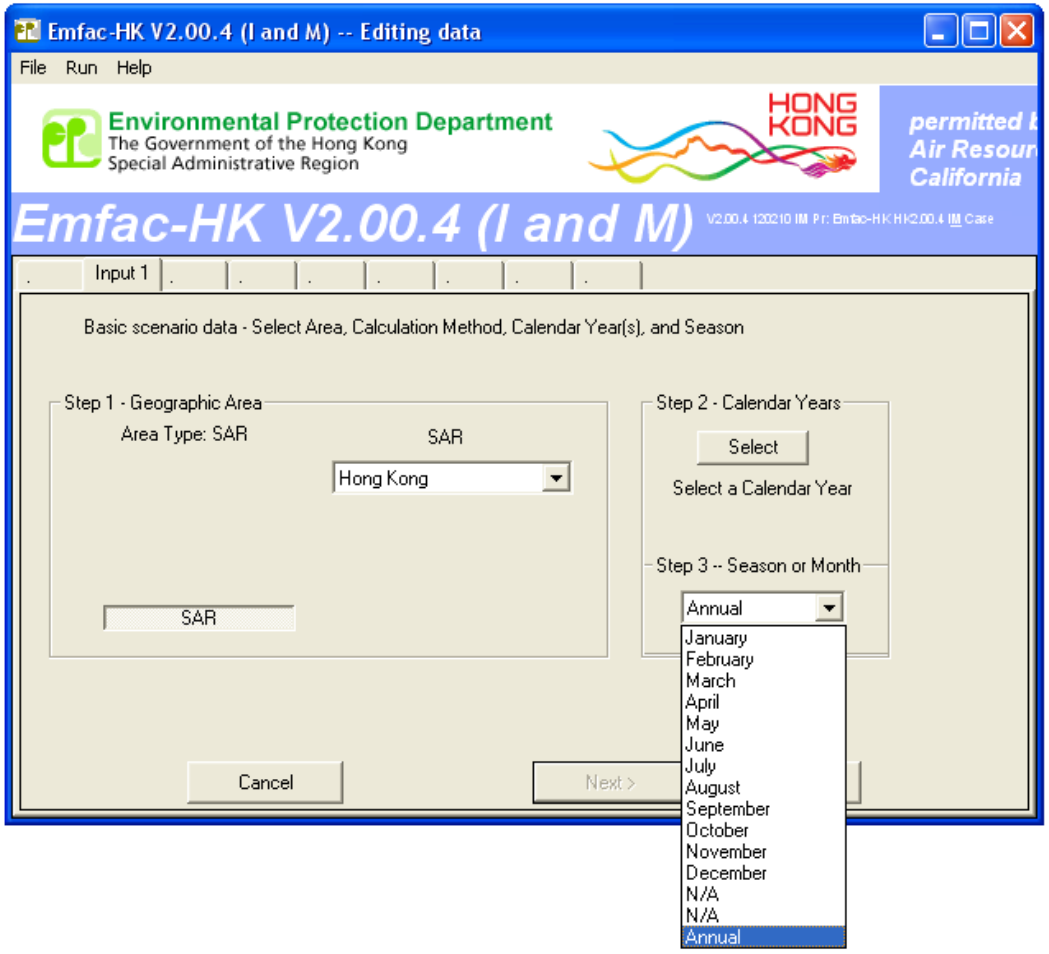
Step 1: Geographic Area



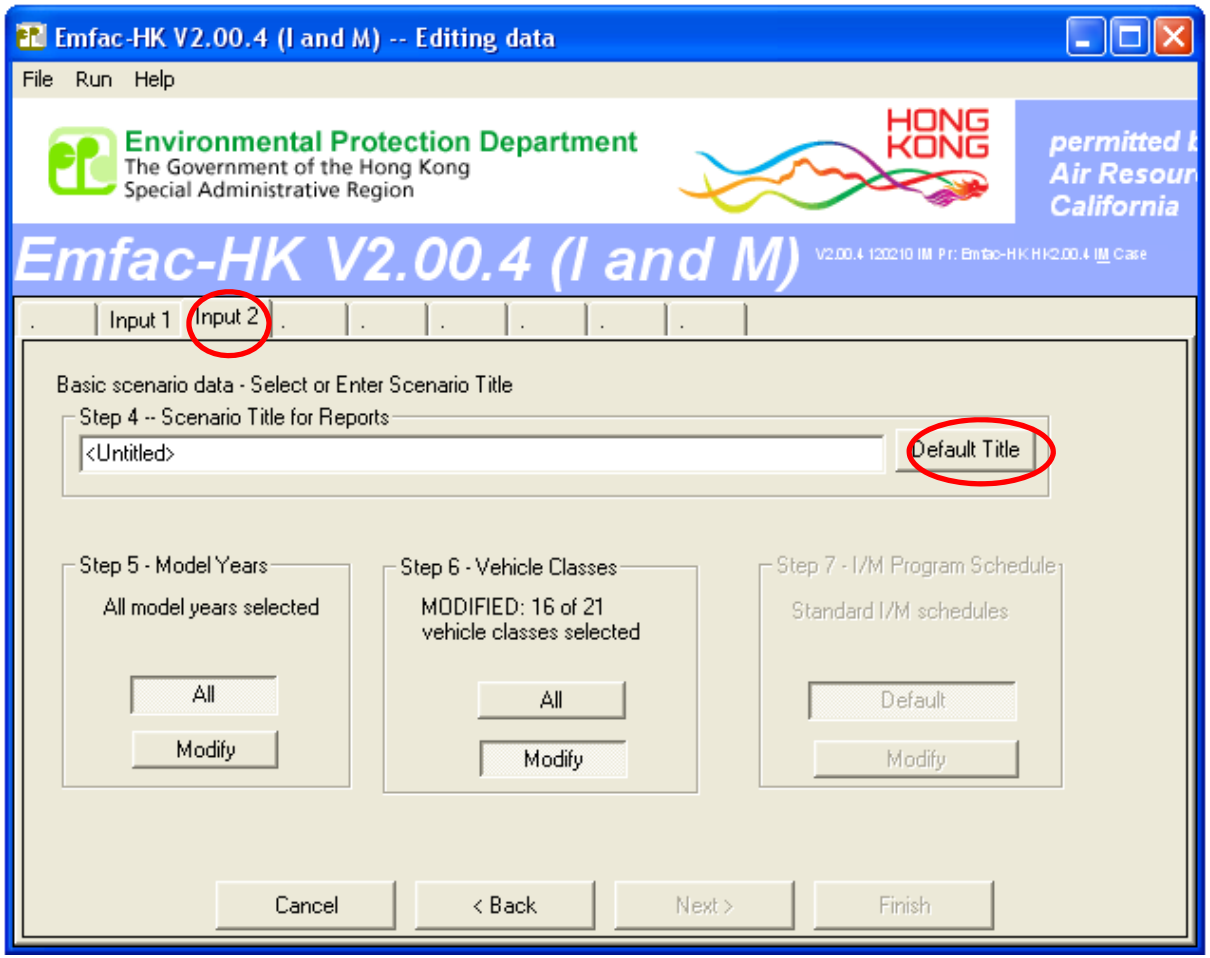
Step 2: Calendar Year Selection (I&M Version)



Step 3: Annual or Month Selection



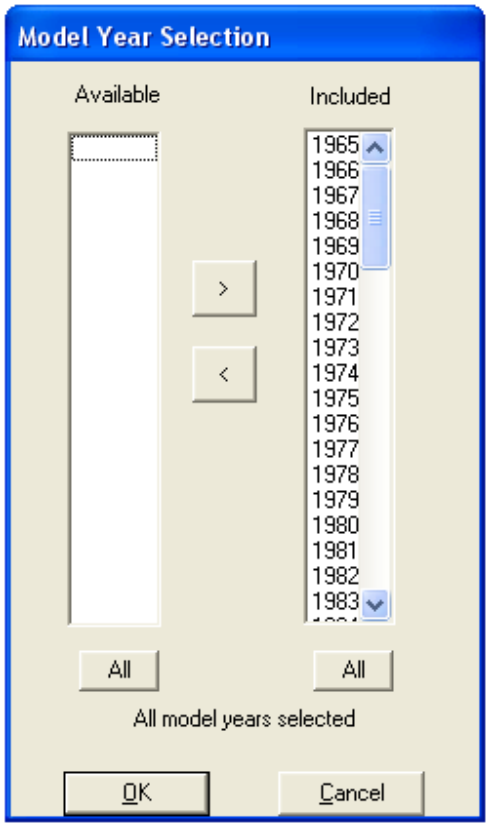
Steps 4-7: Scenario Details Screen



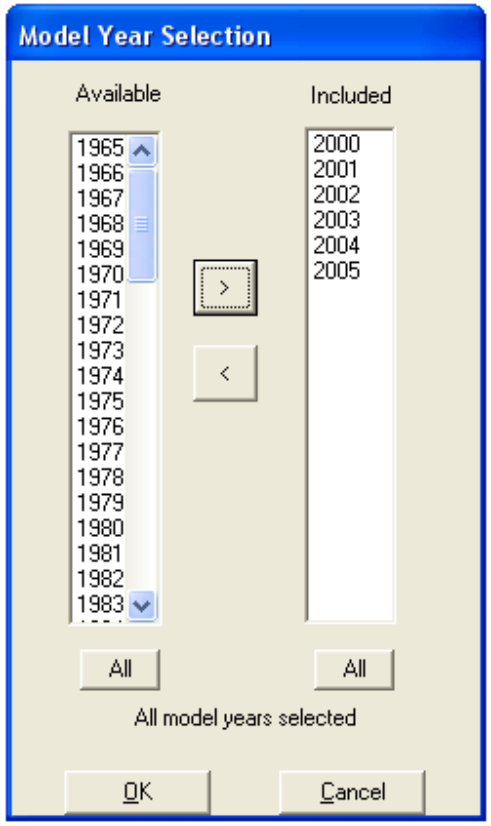
Step 7: I/M Options/Program Schedule deactivated in GUI.

Step 5: Model Year Selection

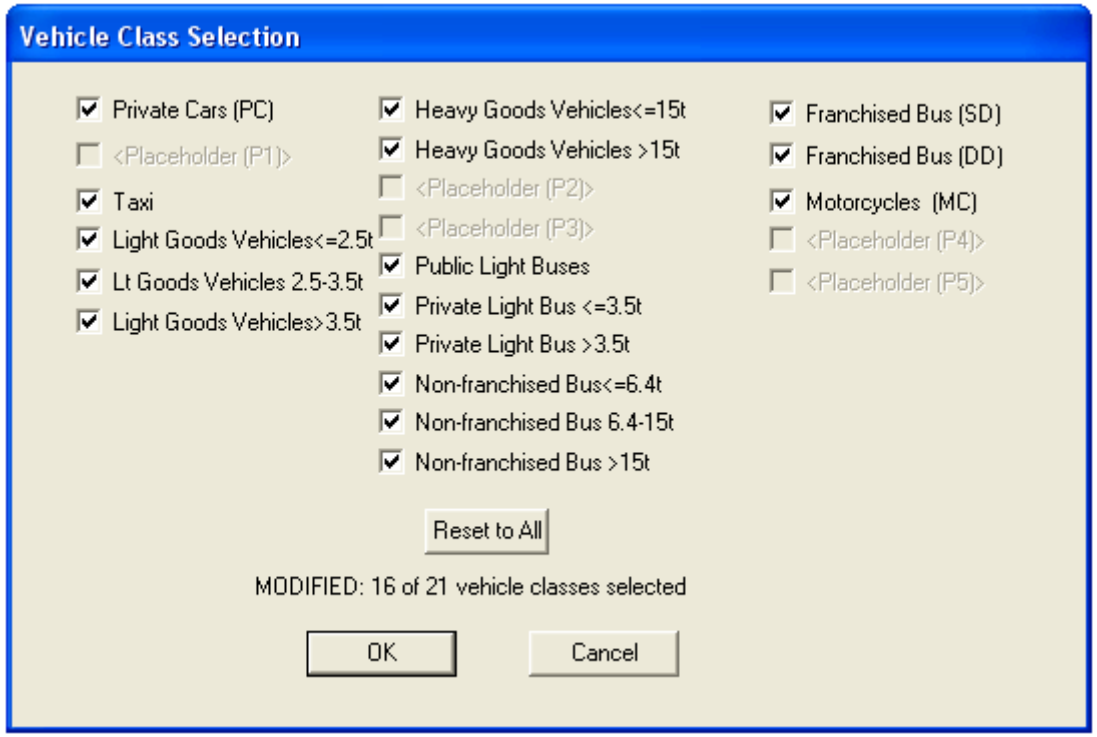
Before Changes



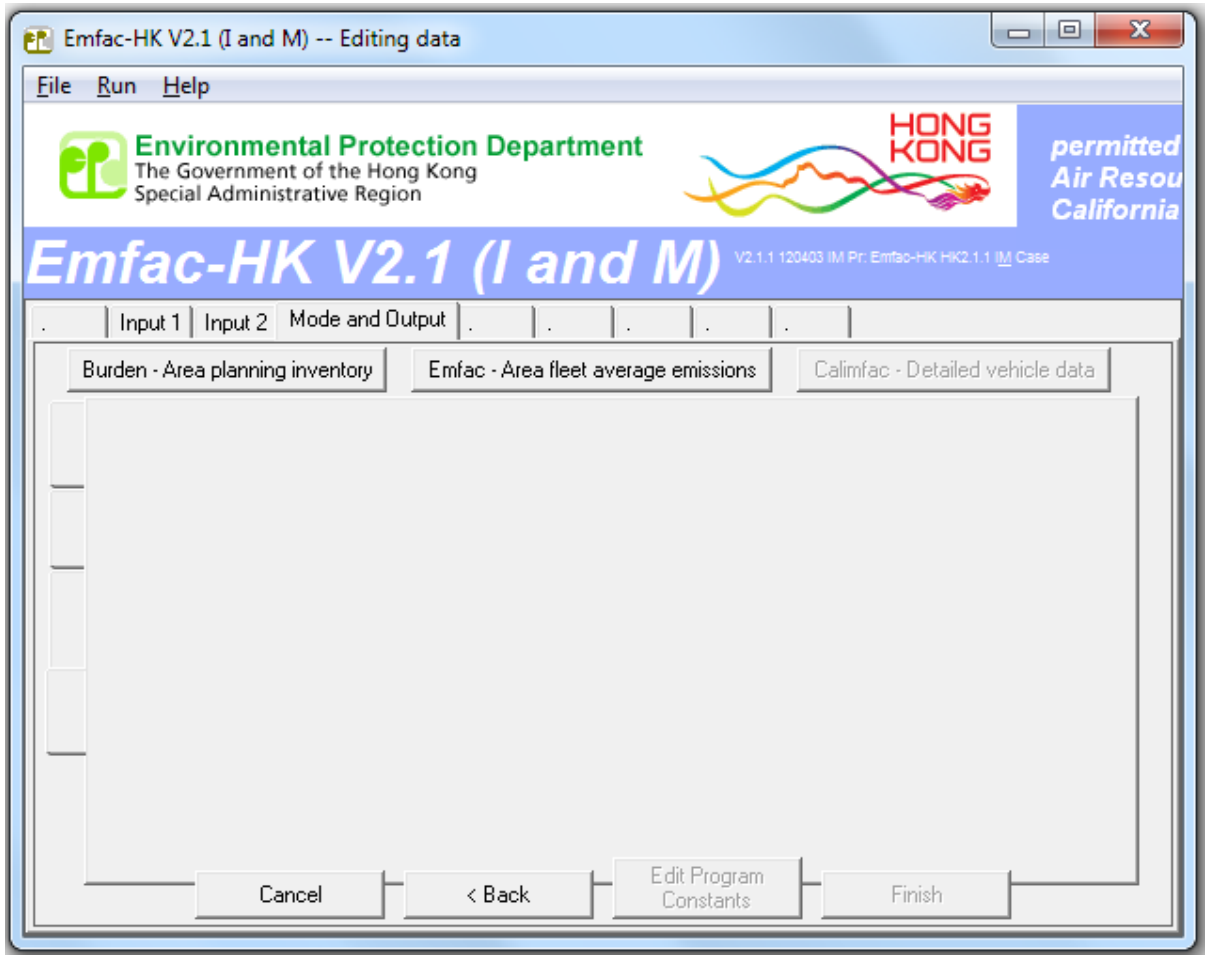
After Changes



Step 6: Vehicle Class Selection

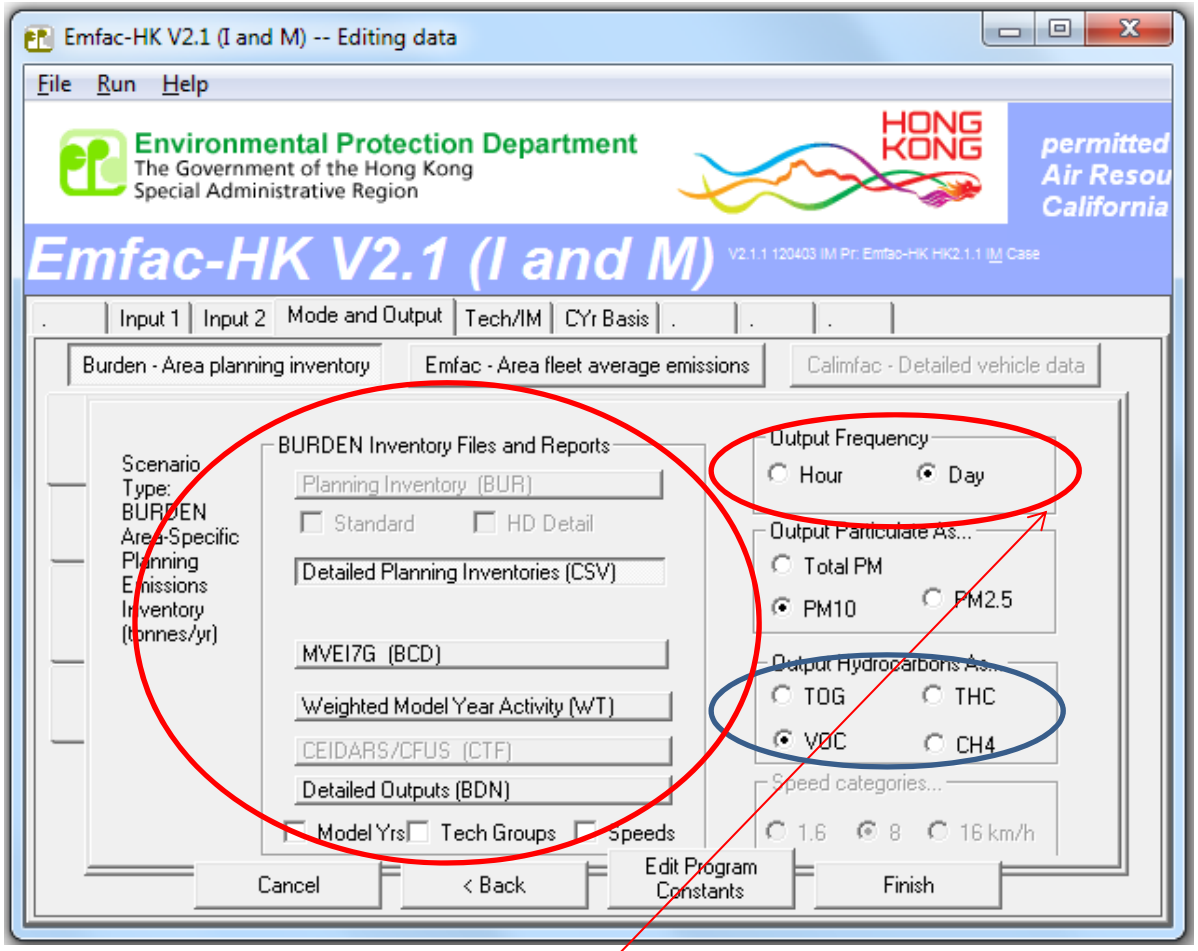


Mode and Output Screens



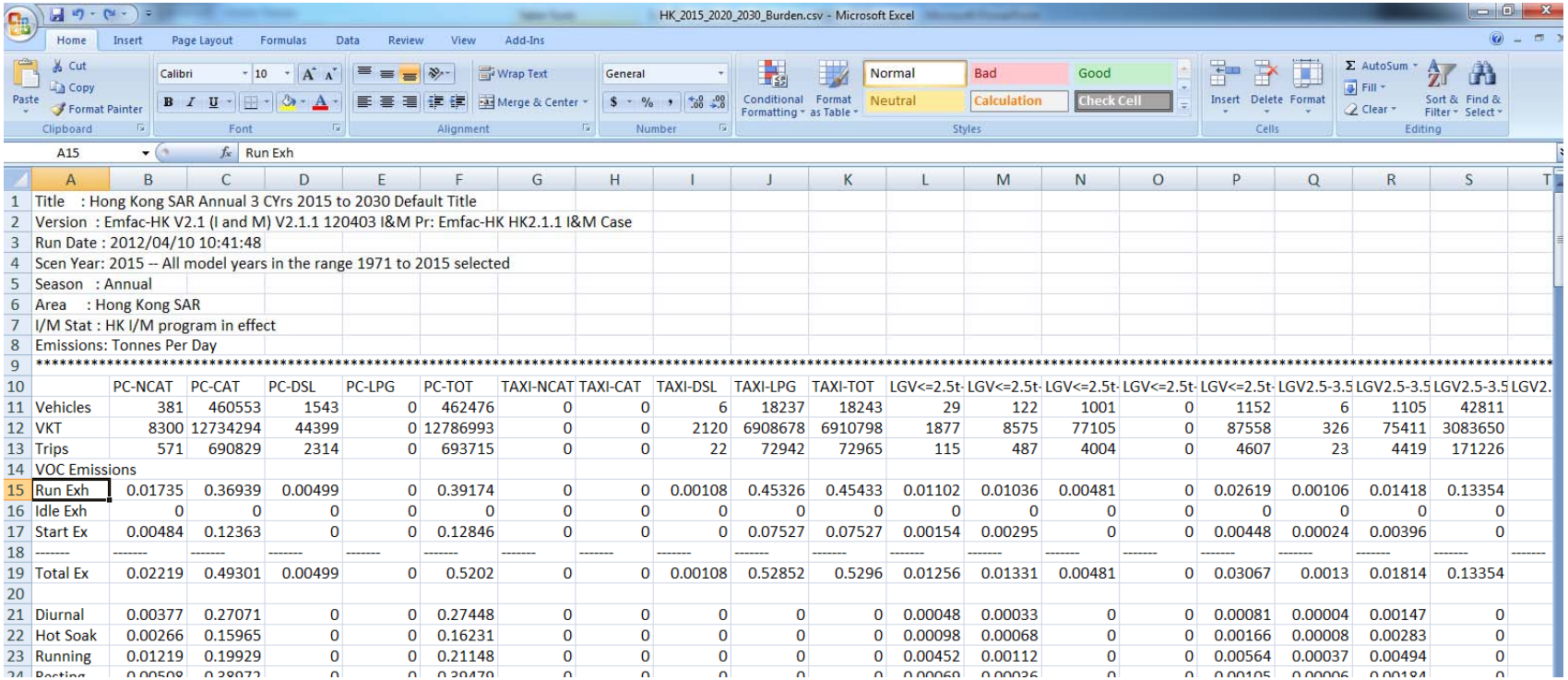
Version 2.1 has separate tabs for each operating mode.

BURDEN Output Options



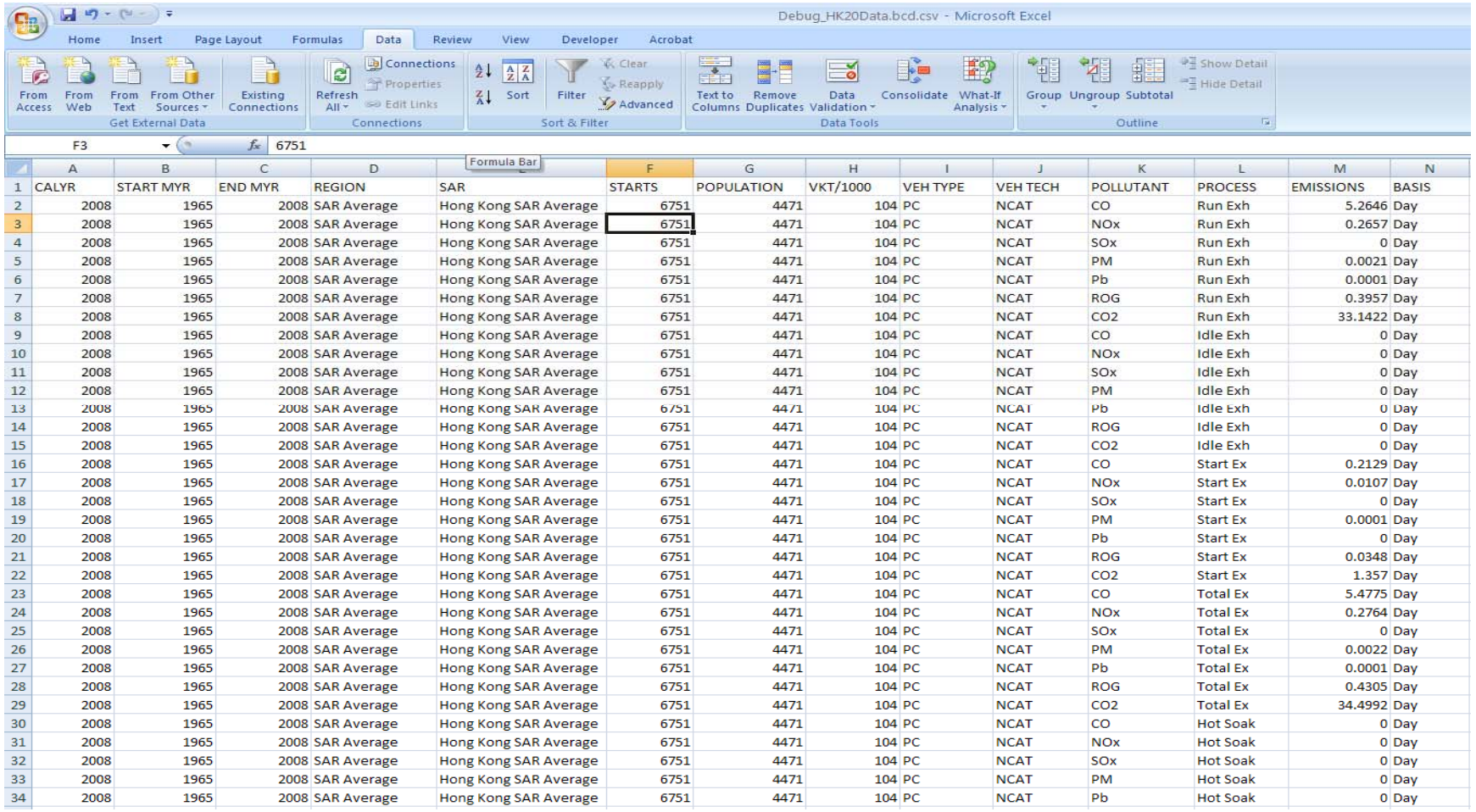
Hour frequency increases output by factor of **25**

Detailed Planning Inventory (*.csv)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Title : Hong Kong SAR Annual 3 CYrs 2015 to 2030 Default Title																			
2	Version : Emfac-HK V2.1 (I and M) V2.1.1 120403 I&M Pr: Emfac-HK HK2.1.1 I&M Case																			
3	Run Date : 2012/04/10 10:41:48																			
4	Scen Year: 2015 -- All model years in the range 1971 to 2015 selected																			
5	Season : Annual																			
6	Area : Hong Kong SAR																			
7	I/M Stat : HK I/M program in effect																			
8	Emissions: Tonnes Per Day																			
9	**********																			
10		PC-NCAT	PC-CAT	PC-DSL	PC-LPG	PC-TOT	TAXI-NCAT	TAXI-CAT	TAXI-DSL	TAXI-LPG	TAXI-TOT	LGV<=2.5t	LGV<=2.5t	LGV<=2.5t	LGV<=2.5t	LGV<=2.5t	LGV2.5-3.5	LGV2.5-3.5	LGV2.5-3.5	LGV2.
11	Vehicles	381	460553	1543	0	462476	0	0	6	18237	18243	29	122	1001	0	1152	6	1105	42811	
12	VKT	8300	12734294	44399	0	12786993	0	0	2120	6908678	6910798	1877	8575	77105	0	87558	326	75411	3083650	
13	Trips	571	690829	2314	0	693715	0	0	22	72942	72965	115	487	4004	0	4607	23	4419	171226	
14	VOC Emissions																			
15	Run Exh	0.01735	0.36939	0.00499	0	0.39174	0	0	0.00108	0.45326	0.45433	0.01102	0.01036	0.00481	0	0.02619	0.00106	0.01418	0.13354	
16	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17	Start Ex	0.00484	0.12363	0	0	0.12846	0	0	0	0.07527	0.07527	0.00154	0.00295	0	0	0.00448	0.00024	0.00396	0	
18	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
19	Total Ex	0.02219	0.49301	0.00499	0	0.5202	0	0	0.00108	0.52852	0.5296	0.01256	0.01331	0.00481	0	0.03067	0.0013	0.01814	0.13354	
20																				
21	Diurnal	0.00377	0.27071	0	0	0.27448	0	0	0	0	0	0.00048	0.00033	0	0	0.00081	0.00004	0.00147	0	
22	Hot Soak	0.00266	0.15965	0	0	0.16231	0	0	0	0	0	0.00098	0.00068	0	0	0.00166	0.00008	0.00283	0	
23	Running	0.01219	0.19929	0	0	0.21148	0	0	0	0	0	0.00452	0.00112	0	0	0.00564	0.00037	0.00494	0	
24	Resting	0.00508	0.38972	0	0	0.39479	0	0	0	0	0	0.00069	0.00036	0	0	0.00105	0.00006	0.00184	0	

MVEI7G CSV file (*.bcd.csv)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATION	VKT/1000	VEH TYPE	VEH TECH	POLLUTANT	PROCESS	EMISSIONS	BASIS
2	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO	Run Exh	5.2646	Day
3	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	NOx	Run Exh	0.2657	Day
4	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	SOx	Run Exh	0	Day
5	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	PM	Run Exh	0.0021	Day
6	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	Pb	Run Exh	0.0001	Day
7	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	ROG	Run Exh	0.3957	Day
8	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO2	Run Exh	33.1422	Day
9	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO	Idle Exh	0	Day
10	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	NOx	Idle Exh	0	Day
11	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	SOx	Idle Exh	0	Day
12	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	PM	Idle Exh	0	Day
13	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	Pb	Idle Exh	0	Day
14	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	ROG	Idle Exh	0	Day
15	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO2	Idle Exh	0	Day
16	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO	Start Ex	0.2129	Day
17	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	NOx	Start Ex	0.0107	Day
18	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	SOx	Start Ex	0	Day
19	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	PM	Start Ex	0.0001	Day
20	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	Pb	Start Ex	0	Day
21	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	ROG	Start Ex	0.0348	Day
22	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO2	Start Ex	1.357	Day
23	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO	Total Ex	5.4775	Day
24	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	NOx	Total Ex	0.2764	Day
25	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	SOx	Total Ex	0	Day
26	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	PM	Total Ex	0.0022	Day
27	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	Pb	Total Ex	0.0001	Day
28	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	ROG	Total Ex	0.4305	Day
29	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO2	Total Ex	34.4992	Day
30	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	CO	Hot Soak	0	Day
31	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	NOx	Hot Soak	0	Day
32	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	SOx	Hot Soak	0	Day
33	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	PM	Hot Soak	0	Day
34	2008	1965	2008	SAR Average	Hong Kong SAR Average	6751	4471	104	PC	NCAT	Pb	Hot Soak	0	Day

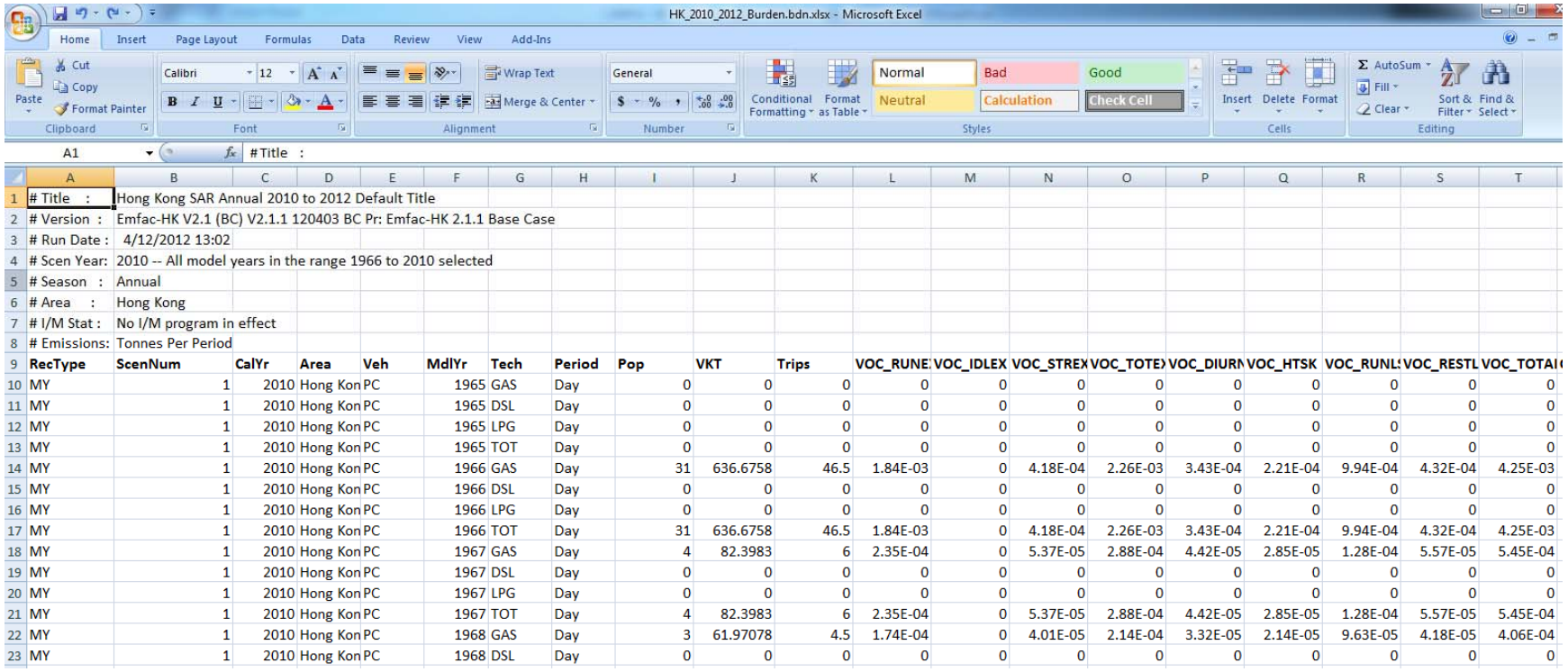
Weighted Model Year Activity Output (*.WT)

UltraEdit - [C:\Documents and Settings\Arney\My Documents\My Projects\ERG\EMFAC\HongKong\Task 6 - Testing\EPD Comments\20110216\Debug_HK20Data.wt]

```
---------------------------------------------------------------------------------
Calendar Year: 2008
  Model Years: 1965 to 2008
        Title: Hong Kong SAR Annual CYr 2008 Default Title
         Area: Hong Kong
      SubArea: Average
      Program: Emfac-HK working draft V1.99.6.2 110210 Sp: InProgress; GUI (HK Units); 330 TG; HK2.0 Data; HK TG Desc;
     Run Date: 2011/02/17 13:08:17
```

SCEN YEAR	VEH CLS	TECH	MYR	VEH POP (number)	VKT/1000 (km/day)	TRIPS (per day)	ACCRUAL (km/yr/veh)	ODOMETER (km/veh)
2008	1	NCAT	1965	21.	0.28	32.	4810.	241367.
2008	1	NCAT	1966	3.	0.04	5.	4824.	236557.
2008	1	NCAT	1967	6.	0.08	9.	4839.	231733.
2008	1	NCAT	1968	4.	0.05	6.	4853.	226894.
2008	1	NCAT	1969	11.	0.15	17.	4868.	222041.
2008	1	NCAT	1970	26.	0.35	39.	4884.	217173.
2008	1	NCAT	1971	16.	0.21	24.	4900.	212289.
2008	1	NCAT	1972	25.	0.34	38.	4916.	207389.
2008	1	NCAT	1973	47.	0.64	71.	4933.	202473.
2008	1	NCAT	1974	35.	0.47	53.	4951.	197540.
2008	1	NCAT	1975	23.	0.31	35.	4969.	192589.
2008	1	NCAT	1976	23.	0.31	35.	4988.	187620.
2008	1	NCAT	1977	41.	0.56	62.	5007.	182632.
2008	1	NCAT	1978	44.	0.61	66.	5028.	177625.
2008	1	NCAT	1979	43.	0.59	65.	5048.	172597.
2008	1	NCAT	1980	84.	1.17	127.	5070.	167549.
2008	1	NCAT	1981	85.	1.19	128.	5093.	162479.
2008	1	NCAT	1982	87.	1.22	131.	5116.	157386.
2008	1	NCAT	1983	32.	0.45	48.	5141.	152270.
2008	1	NCAT	1984	42.	0.59	63.	5166.	147129.
2008	1	NCAT	1985	104.	1.48	157.	5193.	141963.
2008	1	NCAT	1986	175.	2.50	264.	5221.	136770.
2008	1	NCAT	1987	209.	3.01	316.	5251.	131549.
2008	1	NCAT	1988	352.	5.09	532.	5282.	126298.
2008	1	NCAT	1989	552.	8.04	834.	5315.	121016.
2008	1	NCAT	1990	860.	12.61	1299.	5350.	115701.
2008	1	NCAT	1991	1492.	22.02	2253.	5387.	110351.
2008	1	NCAT	1992	2.	0.03	3.	5427.	104964.
2008	1	NCAT	1993	7.	0.10	11.	5469.	99537.
2008	1	NCAT	1994	15.	0.23	23.	5515.	94068.
2008	1	NCAT	1995	5.	0.08	8.	5564.	88553.
2008	1	NCAT	1996	0.	0.00	0.	0.	0.
2008	1	NCAT	1997	0.	0.00	0.	0.	0.

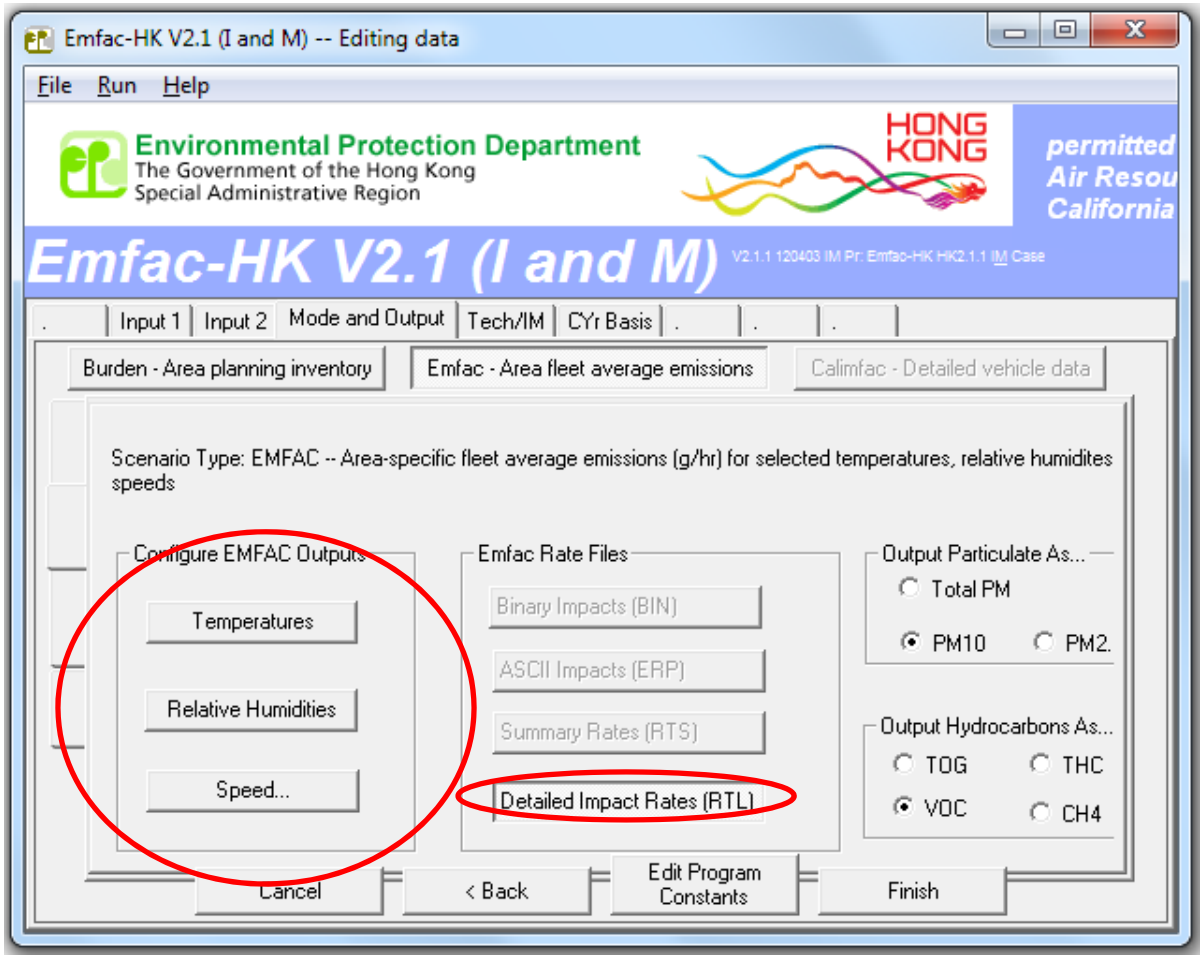
Detailed Output File (*.BDN.CSV)



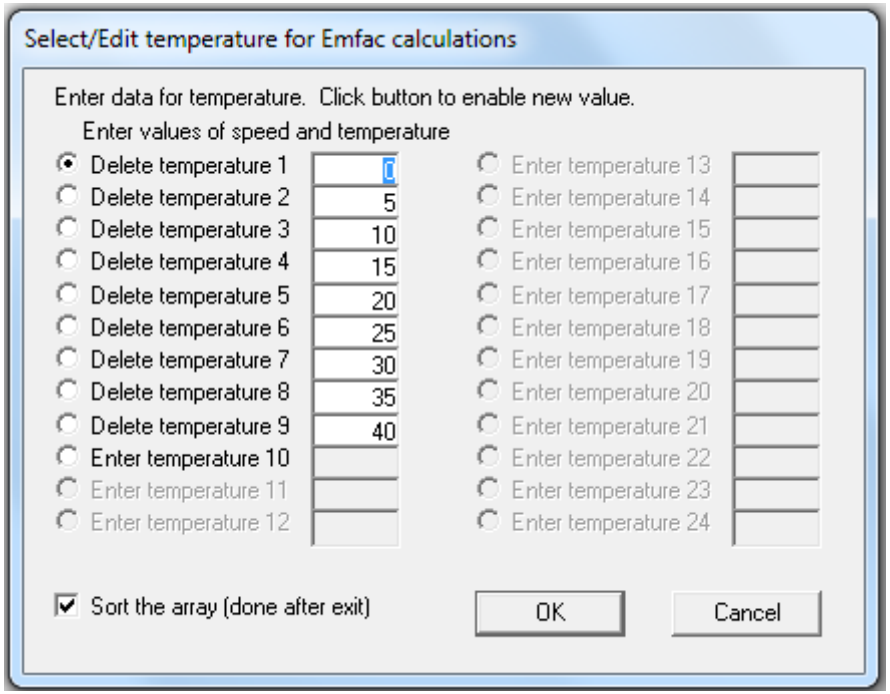
HK_2010_2012_Burden.bdn.xlsx - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	# Title :	Hong Kong SAR Annual 2010 to 2012 Default Title																		
2	# Version :	Emfac-HK V2.1 (BC) V2.1.1 120403 BC Pr: Emfac-HK 2.1.1 Base Case																		
3	# Run Date :	4/12/2012 13:02																		
4	# Scen Year:	2010 -- All model years in the range 1966 to 2010 selected																		
5	# Season :	Annual																		
6	# Area :	Hong Kong																		
7	# I/M Stat :	No I/M program in effect																		
8	# Emissions:	Tonnes Per Period																		
9	RecType	ScenNum	CalYr	Area	Veh	MdlYr	Tech	Period	Pop	VKT	Trips	VOC_RUNE	VOC_IDLEX	VOC_STREX	VOC_TOTE	VOC_DIURN	VOC_HTSK	VOC_RUNL	VOC_RESTL	VOC_TOTAI
10	MY	1	2010	Hong Kon	PC	1965	GAS	Day	0	0	0	0	0	0	0	0	0	0	0	0
11	MY	1	2010	Hong Kon	PC	1965	DSL	Day	0	0	0	0	0	0	0	0	0	0	0	0
12	MY	1	2010	Hong Kon	PC	1965	LPG	Day	0	0	0	0	0	0	0	0	0	0	0	0
13	MY	1	2010	Hong Kon	PC	1965	TOT	Day	0	0	0	0	0	0	0	0	0	0	0	0
14	MY	1	2010	Hong Kon	PC	1966	GAS	Day	31	636.6758	46.5	1.84E-03	0	4.18E-04	2.26E-03	3.43E-04	2.21E-04	9.94E-04	4.32E-04	4.25E-03
15	MY	1	2010	Hong Kon	PC	1966	DSL	Day	0	0	0	0	0	0	0	0	0	0	0	0
16	MY	1	2010	Hong Kon	PC	1966	LPG	Day	0	0	0	0	0	0	0	0	0	0	0	0
17	MY	1	2010	Hong Kon	PC	1966	TOT	Day	31	636.6758	46.5	1.84E-03	0	4.18E-04	2.26E-03	3.43E-04	2.21E-04	9.94E-04	4.32E-04	4.25E-03
18	MY	1	2010	Hong Kon	PC	1967	GAS	Day	4	82.3983	6	2.35E-04	0	5.37E-05	2.88E-04	4.42E-05	2.85E-05	1.28E-04	5.57E-05	5.45E-04
19	MY	1	2010	Hong Kon	PC	1967	DSL	Day	0	0	0	0	0	0	0	0	0	0	0	0
20	MY	1	2010	Hong Kon	PC	1967	LPG	Day	0	0	0	0	0	0	0	0	0	0	0	0
21	MY	1	2010	Hong Kon	PC	1967	TOT	Day	4	82.3983	6	2.35E-04	0	5.37E-05	2.88E-04	4.42E-05	2.85E-05	1.28E-04	5.57E-05	5.45E-04
22	MY	1	2010	Hong Kon	PC	1968	GAS	Day	3	61.97078	4.5	1.74E-04	0	4.01E-05	2.14E-04	3.32E-05	2.14E-05	9.63E-05	4.18E-05	4.06E-04
23	MY	1	2010	Hong Kon	PC	1968	DSL	Day	0	0	0	0	0	0	0	0	0	0	0	0

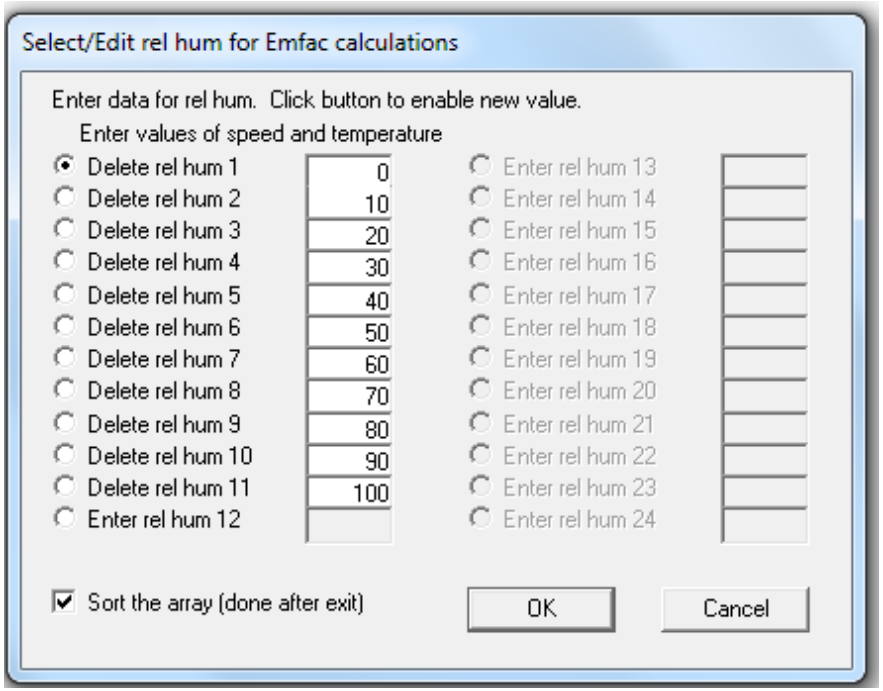
EMFAC Mode Options



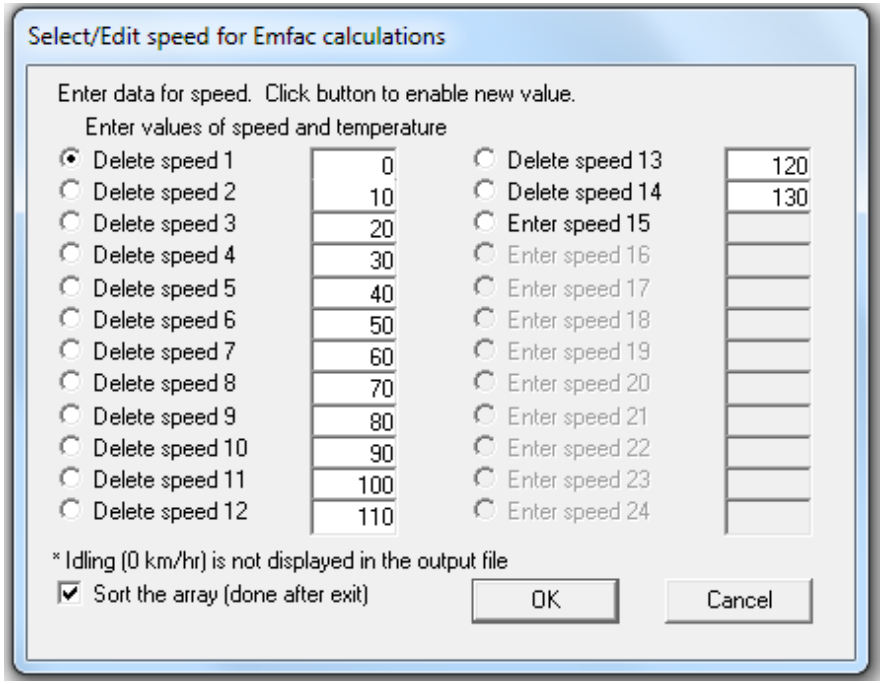
EMFAC Mode Options – Select/Edit Temperatures (ºC)



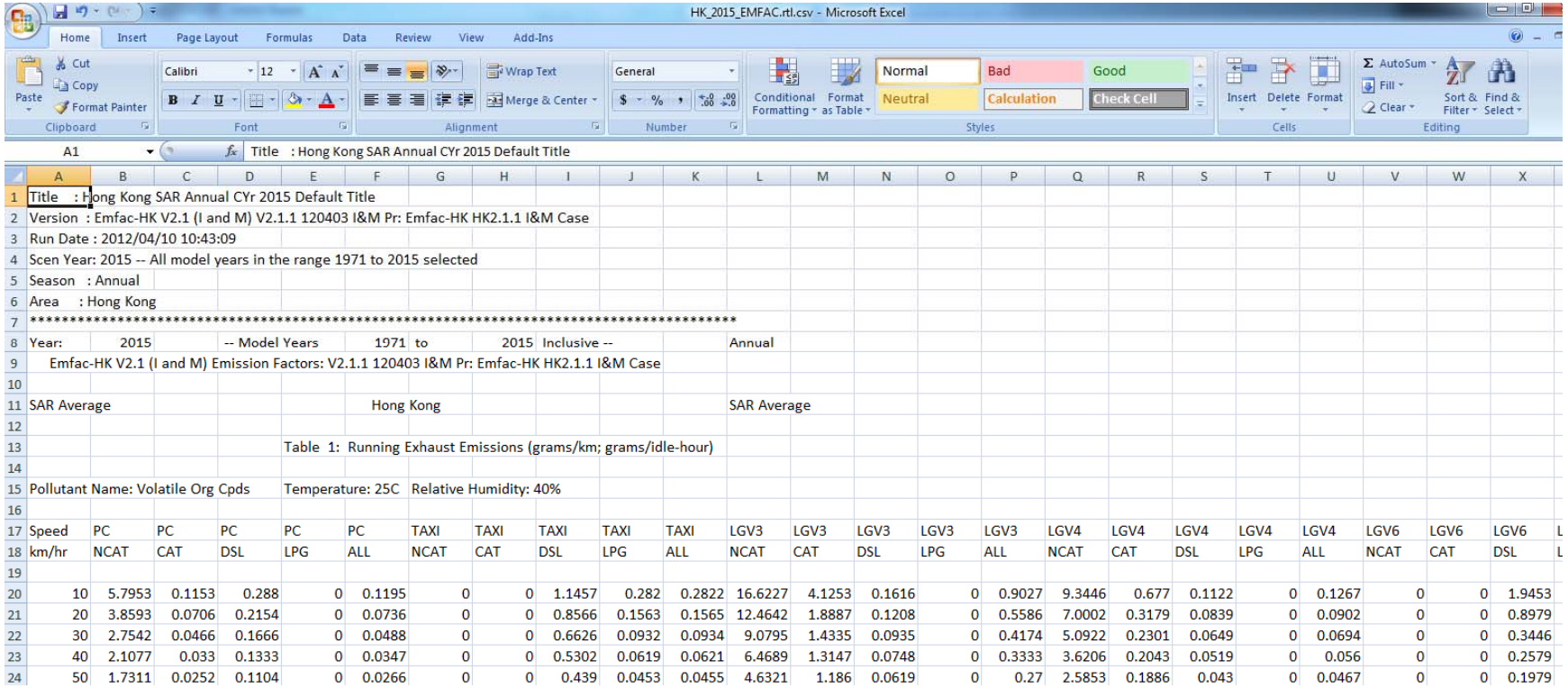
EMFAC Mode Options – Select/Edit Relative Humidity (%)



EMFAC Mode Options – Select/Edit Speed Profiles (kph)

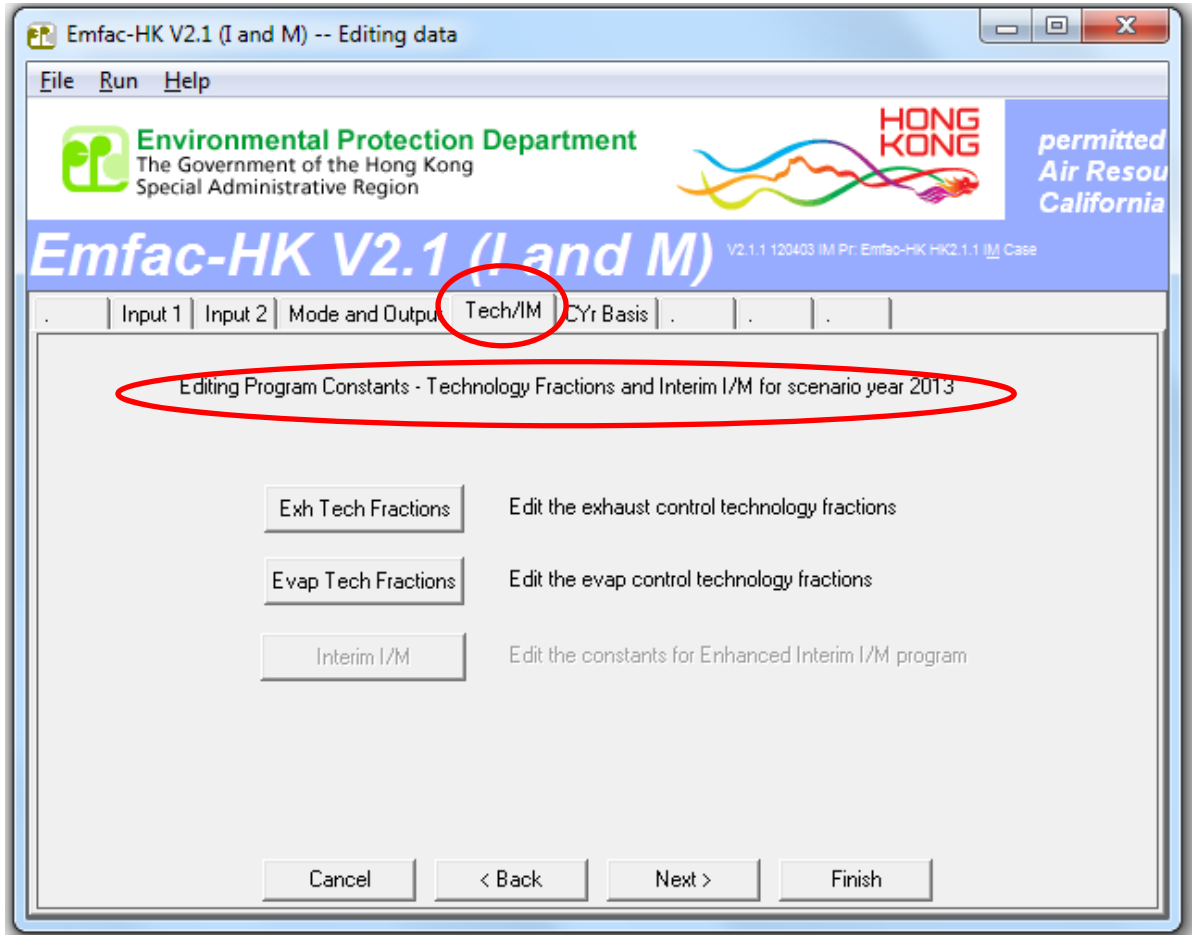


EMFAC Impact Rate Detail Format (*.RTL)

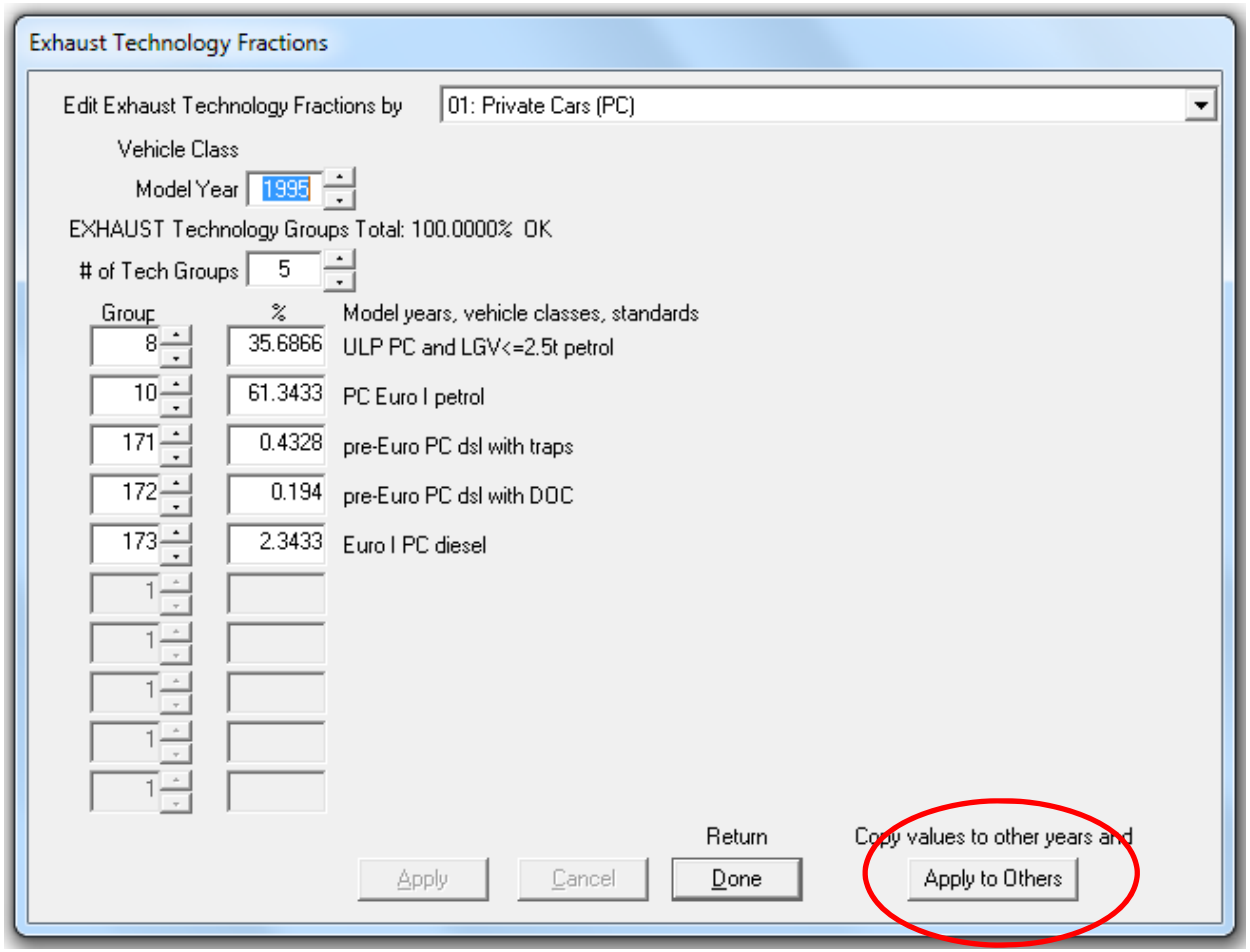


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	Title : Hong Kong SAR Annual CYr 2015 Default Title																							
2	Version : Emfac-HK V2.1 (I and M) V2.1.1 120403 I&M Pr: Emfac-HK HK2.1.1 I&M Case																							
3	Run Date : 2012/04/10 10:43:09																							
4	Scen Year: 2015 -- All model years in the range 1971 to 2015 selected																							
5	Season : Annual																							
6	Area : Hong Kong																							
7	**********																							
8	Year:	2015		-- Model Years		1971	to	2015	Inclusive --			Annual												
9	Emfac-HK V2.1 (I and M) Emission Factors: V2.1.1 120403 I&M Pr: Emfac-HK HK2.1.1 I&M Case																							
10																								
11	SAR Average					Hong Kong						SAR Average												
12																								
13					Table 1: Running Exhaust Emissions (grams/km; grams/idle-hour)																			
14																								
15	Pollutant Name: Volatile Org Cpds				Temperature: 25C		Relative Humidity: 40%																	
16																								
17	Speed	PC	PC	PC	PC	PC	TAXI	TAXI	TAXI	TAXI	TAXI	LGV3	LGV3	LGV3	LGV3	LGV3	LGV4	LGV4	LGV4	LGV4	LGV4	LGV6	LGV6	LGV6	L
18	km/hr	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	L
19																								
20	10	5.7953	0.1153	0.288	0	0.1195	0	0	1.1457	0.282	0.2822	16.6227	4.1253	0.1616	0	0.9027	9.3446	0.677	0.1122	0	0.1267	0	0	1.9453	
21	20	3.8593	0.0706	0.2154	0	0.0736	0	0	0.8566	0.1563	0.1565	12.4642	1.8887	0.1208	0	0.5586	7.0002	0.3179	0.0839	0	0.0902	0	0	0.8979	
22	30	2.7542	0.0466	0.1666	0	0.0488	0	0	0.6626	0.0932	0.0934	9.0795	1.4335	0.0935	0	0.4174	5.0922	0.2301	0.0649	0	0.0694	0	0	0.3446	
23	40	2.1077	0.033	0.1333	0	0.0347	0	0	0.5302	0.0619	0.0621	6.4689	1.3147	0.0748	0	0.3333	3.6206	0.2043	0.0519	0	0.056	0	0	0.2579	
24	50	1.7311	0.0252	0.1104	0	0.0266	0	0	0.439	0.0453	0.0455	4.6321	1.186	0.0619	0	0.27	2.5853	0.1886	0.043	0	0.0467	0	0	0.1979	

Editing Fundamental Data

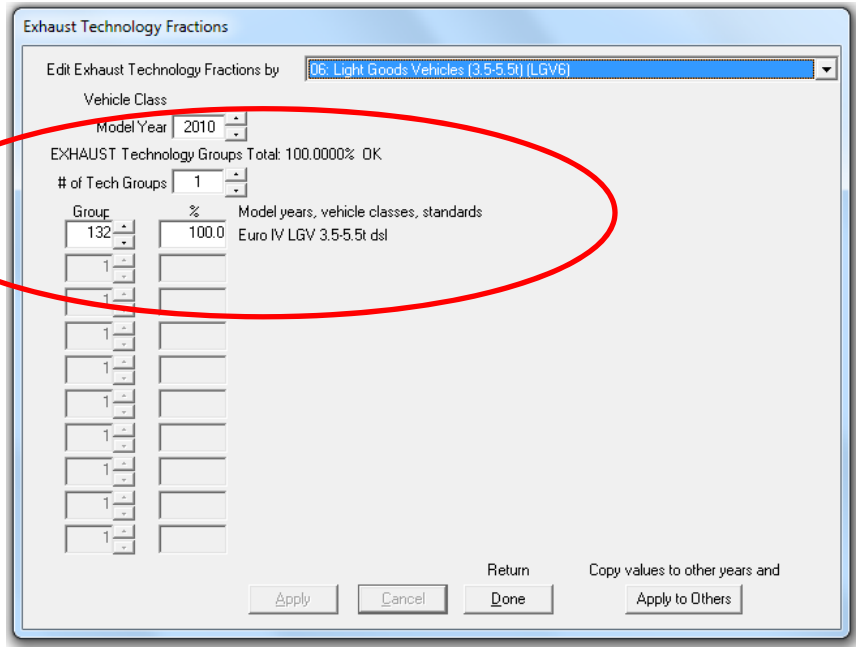


Editing Exhaust Technology Fractions

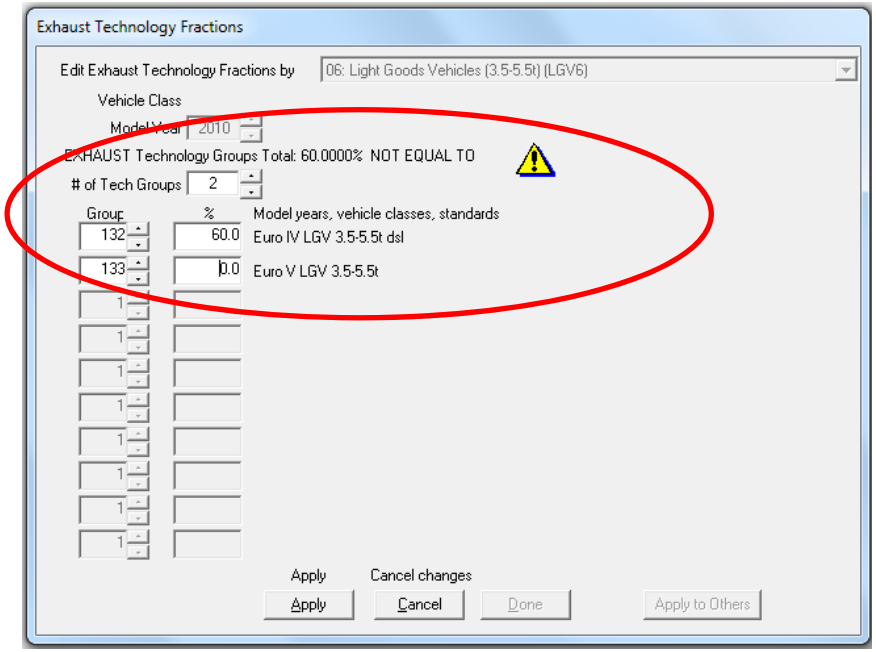


Editing Exhaust Technology Fractions (cont.)

Before Edit

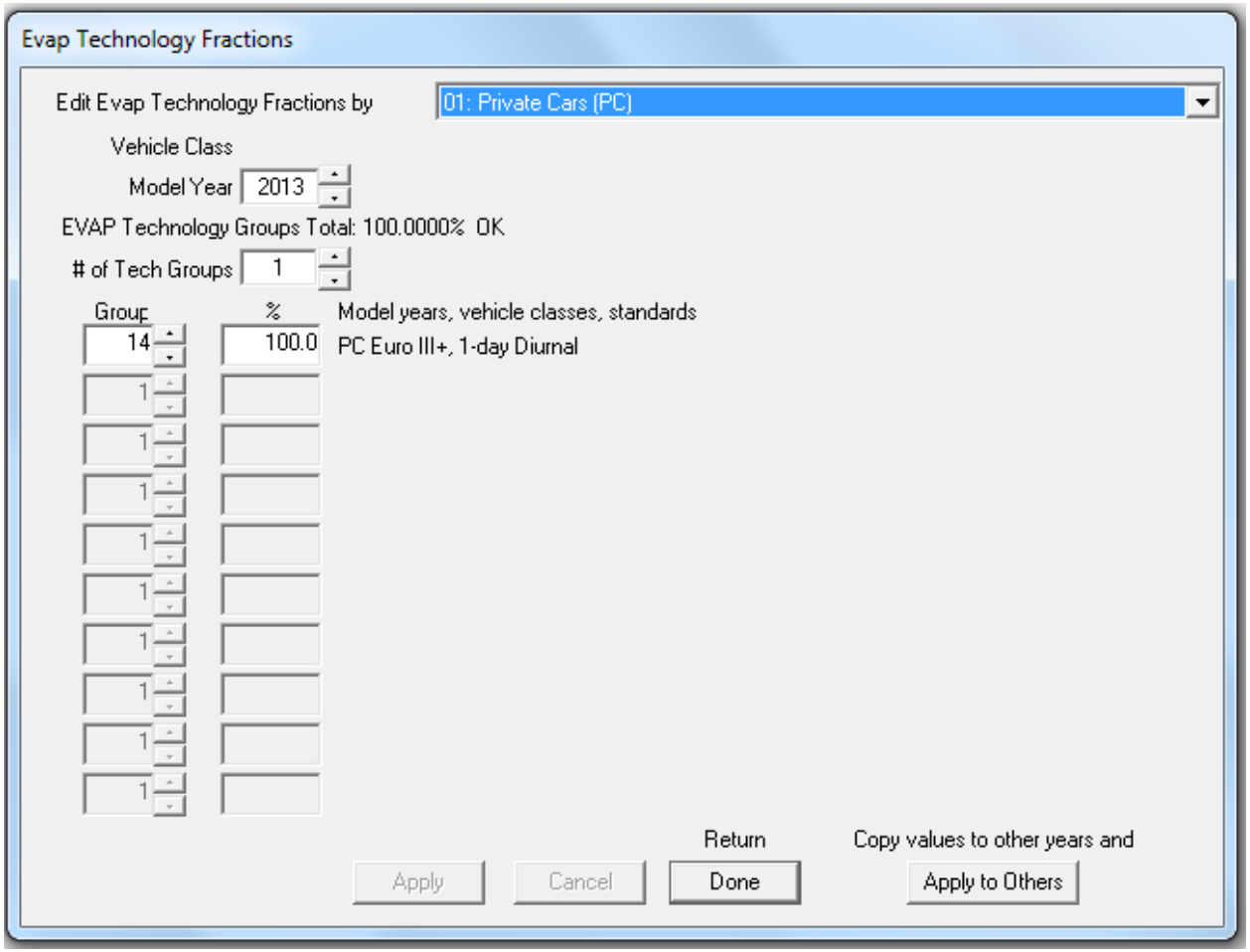


"During" Edit



Introducing another Exhaust TG. Note warning is displayed that total percentage is not 100%, yet. New percentage entered will be 40%.

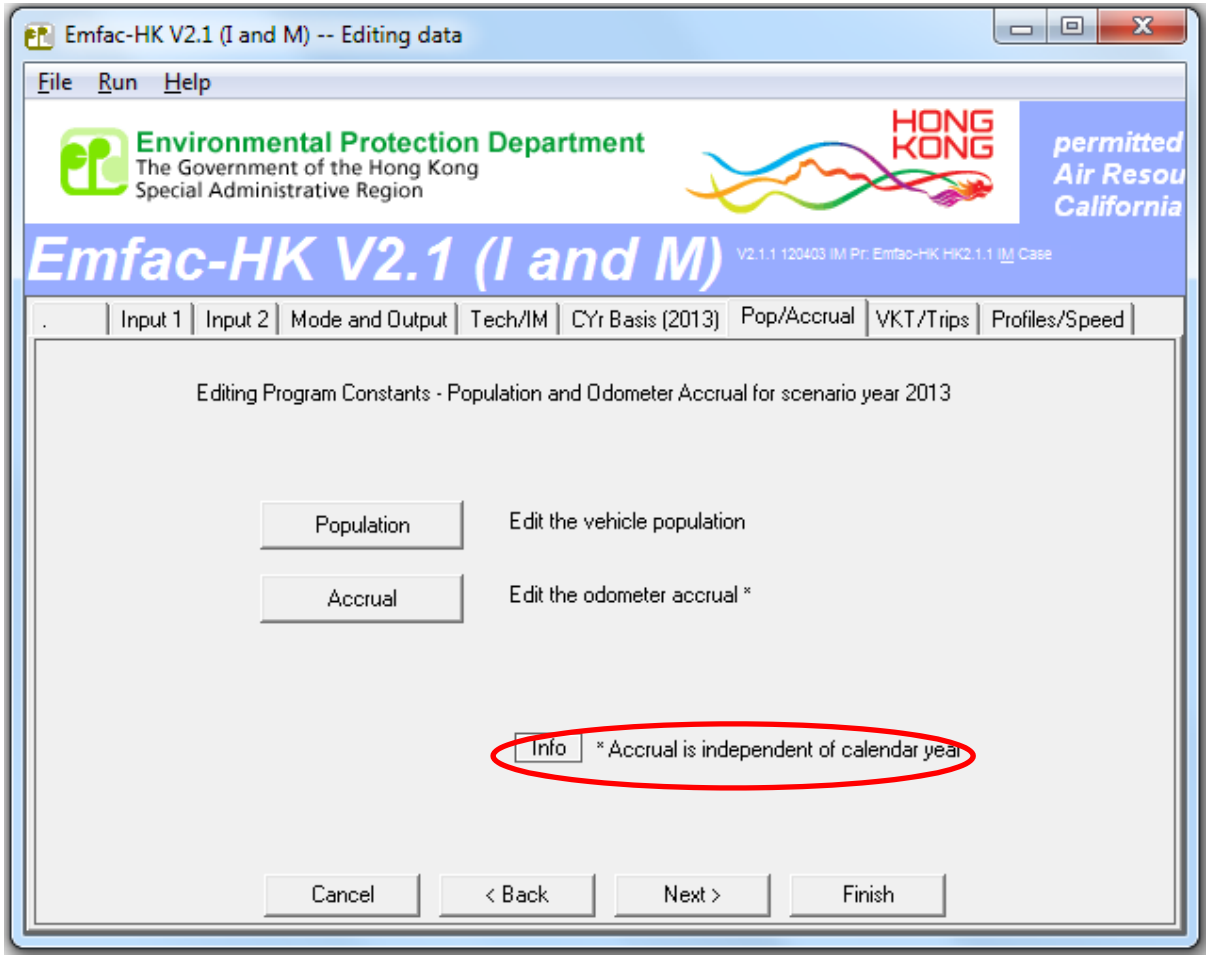
Editing Evap Technology Fractions



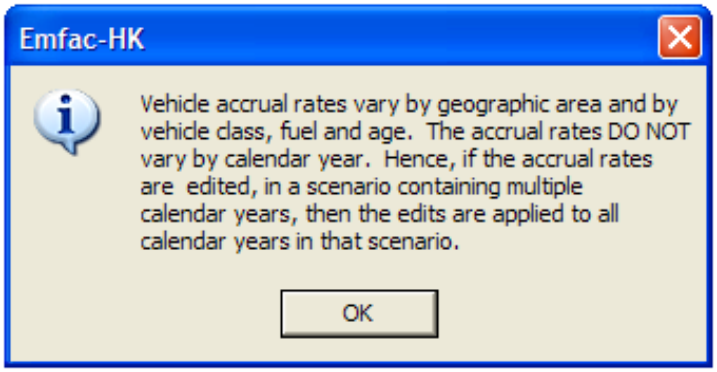
Changing Activity Data

- edit fundamental activity data such as population, accrual rates, trips and vehicle kilometers traveled.
- dialogs are sequenced noting the inter-dependencies among the data

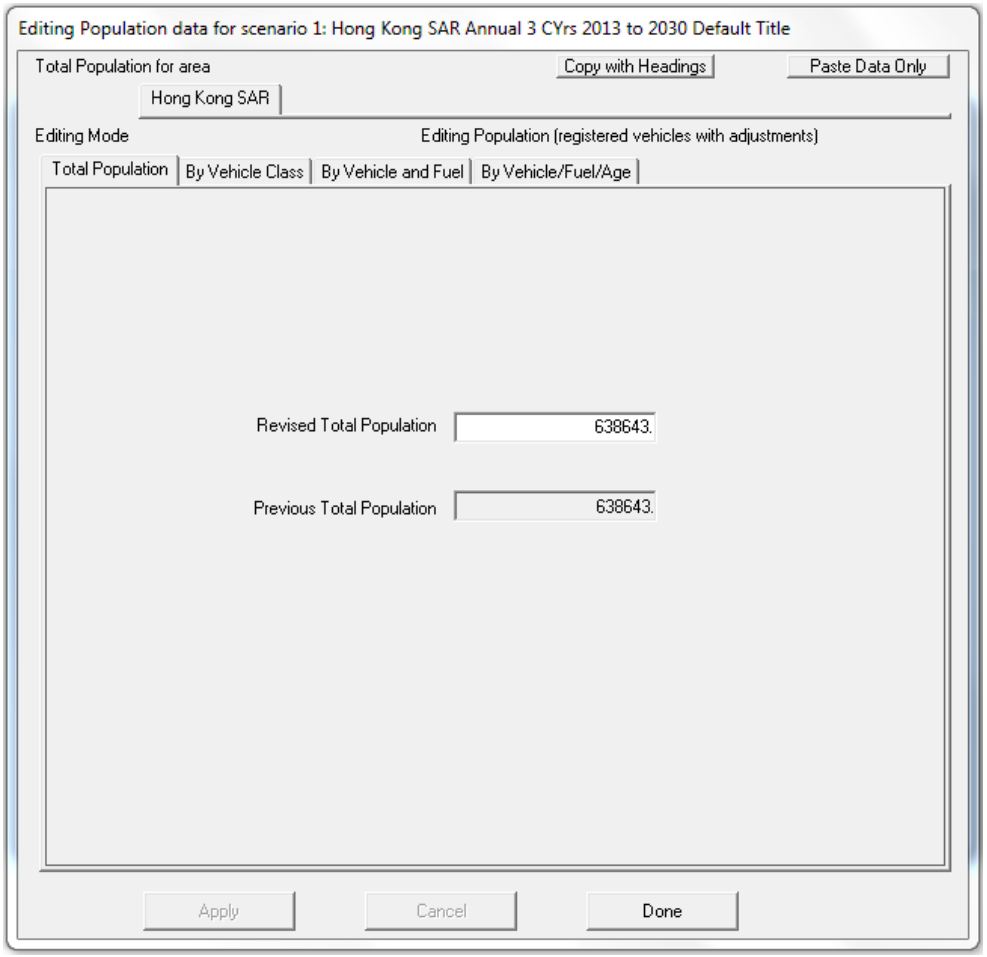
Population and Accrual Edits



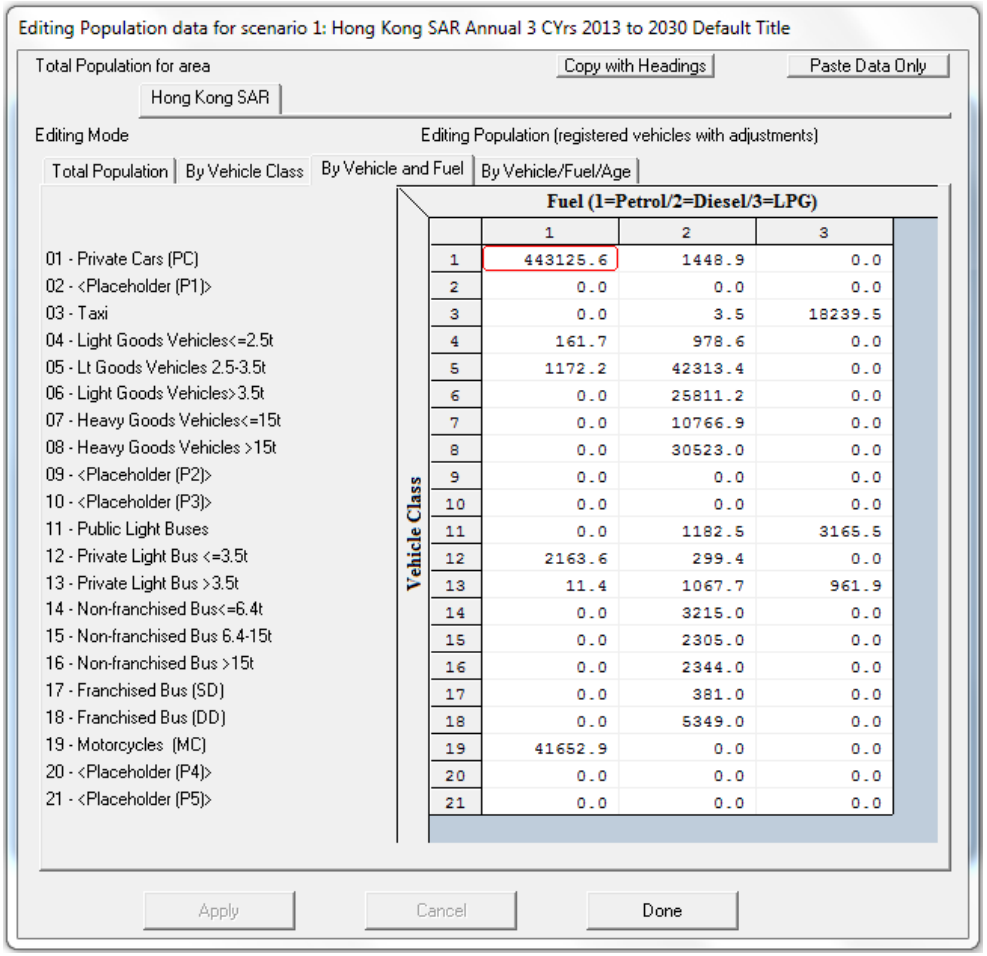
Info on Accrual Rates



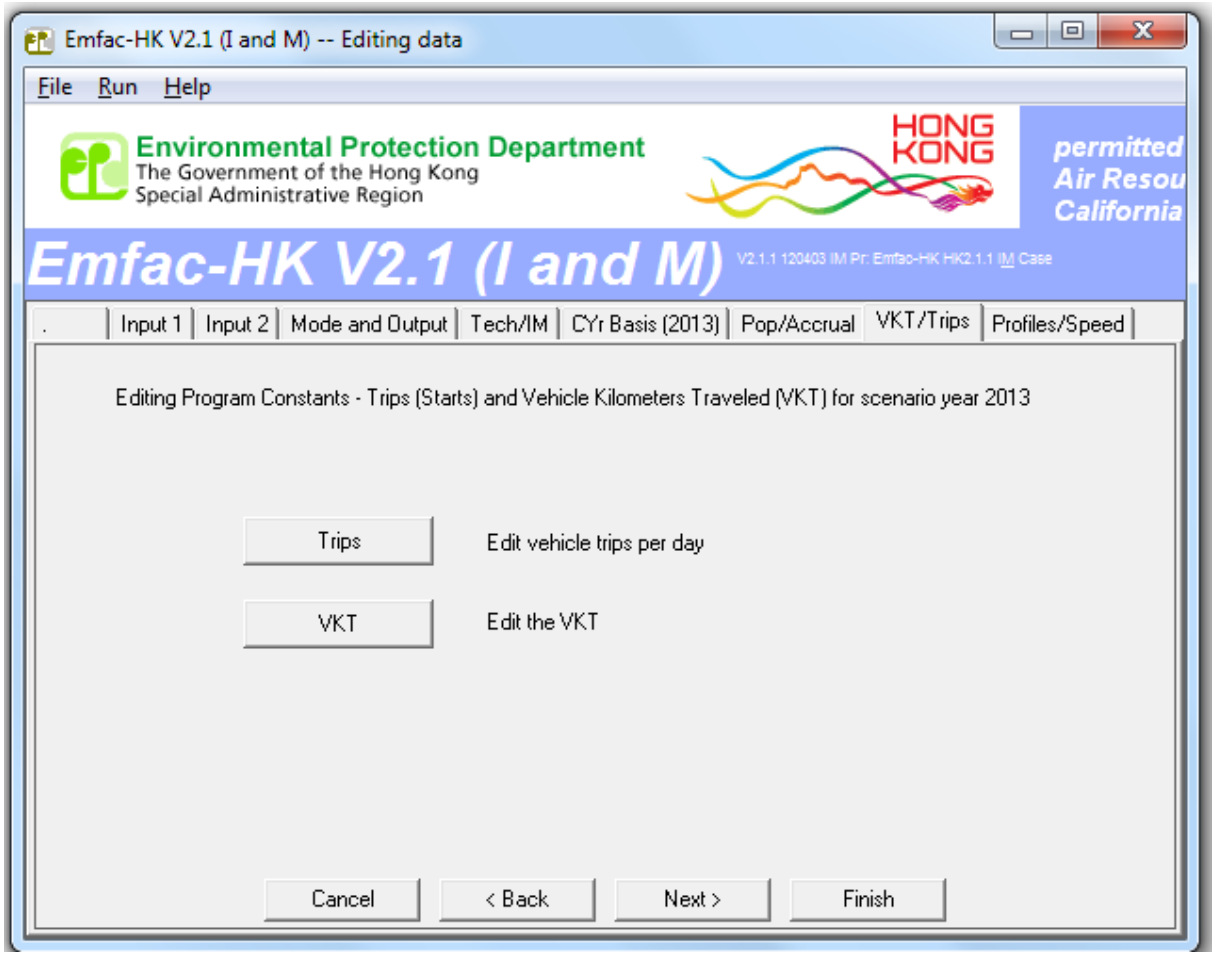
Editing Total Population



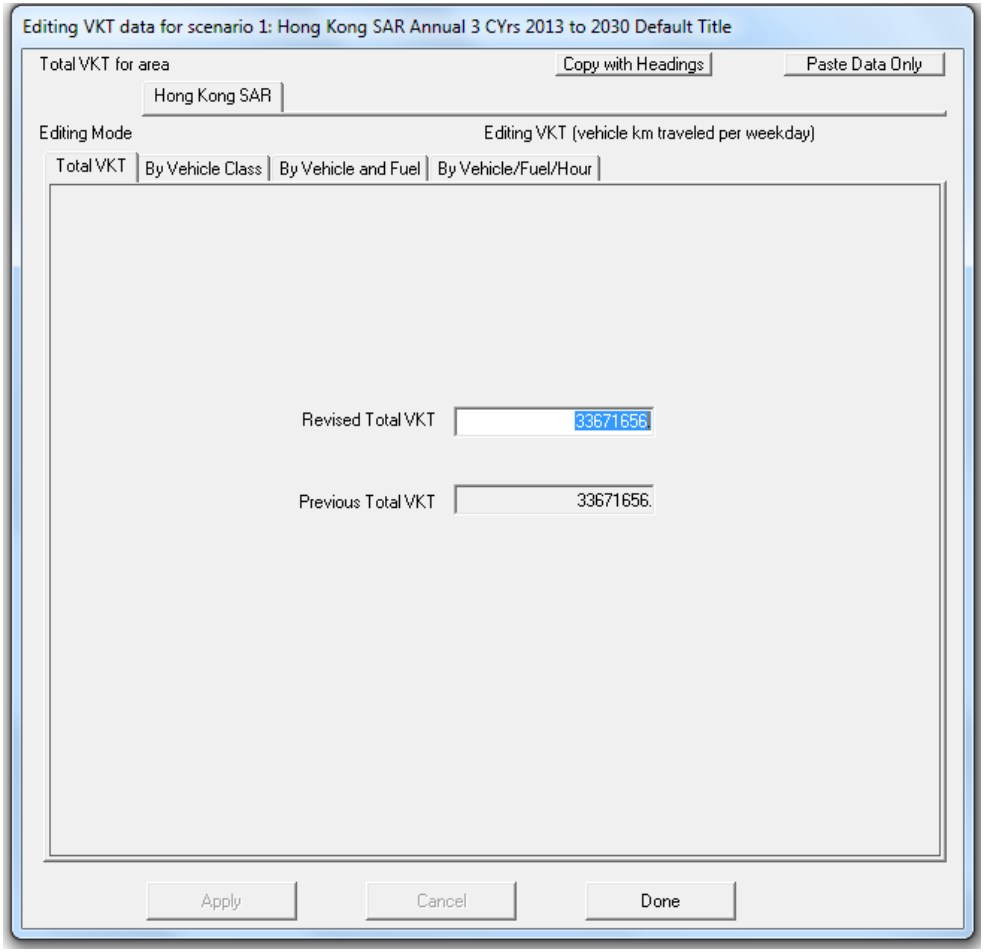
Editing Population by Vehicle Class and Fuel Type



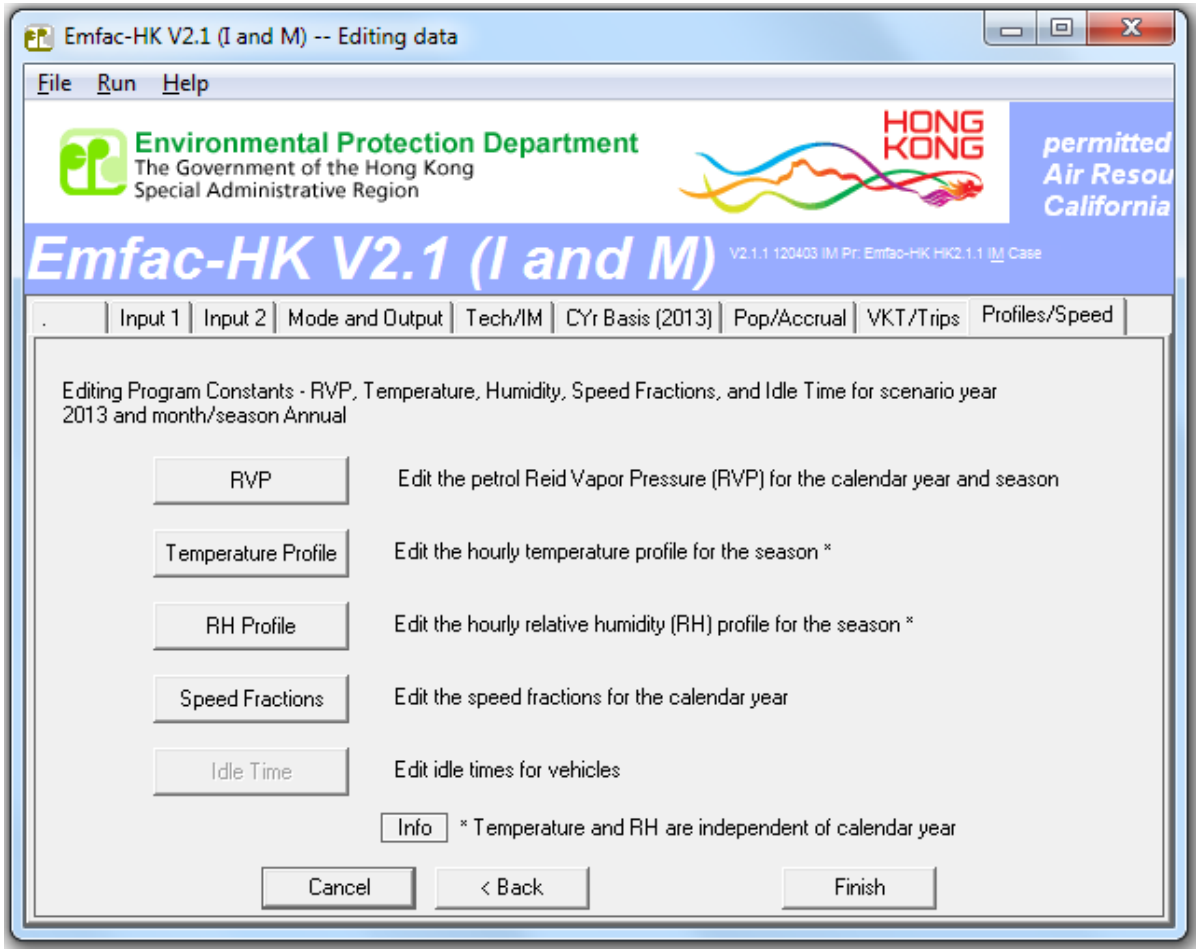
Editing Trip and VKT Profiles



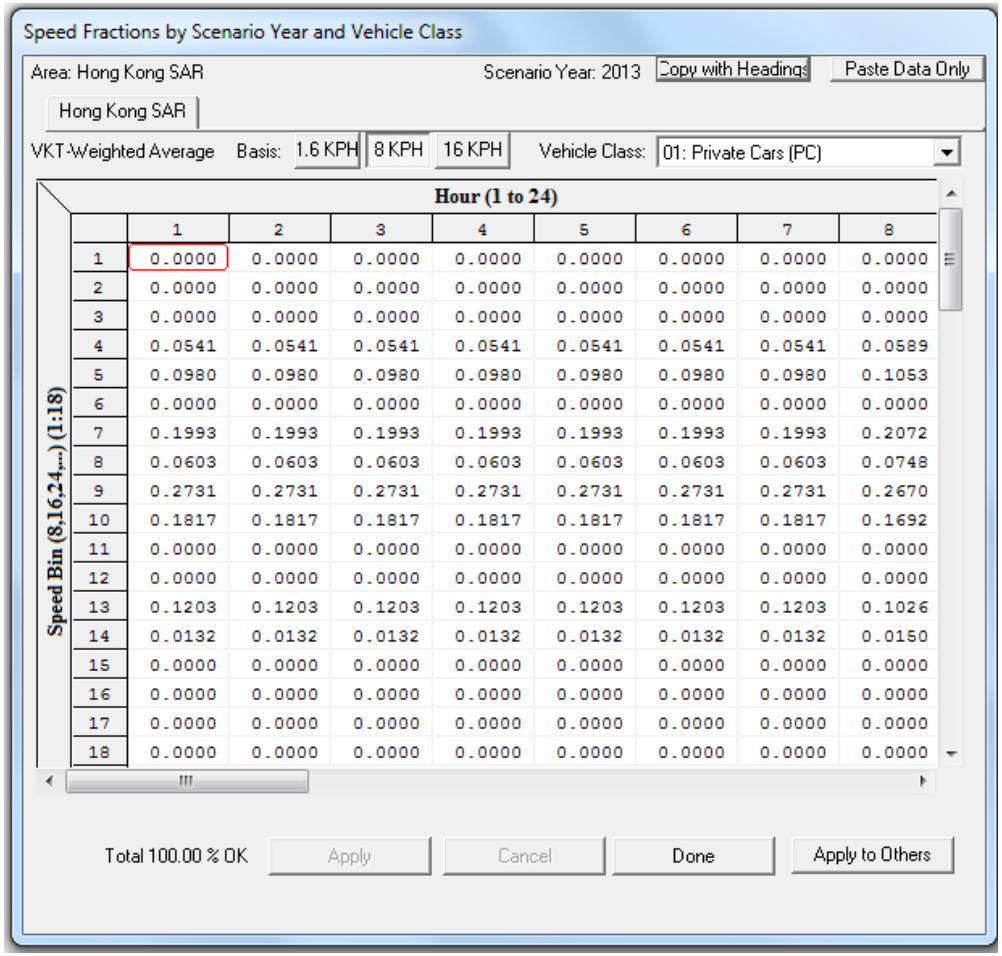
Editing Total VKT



Editing Profiles/Speed

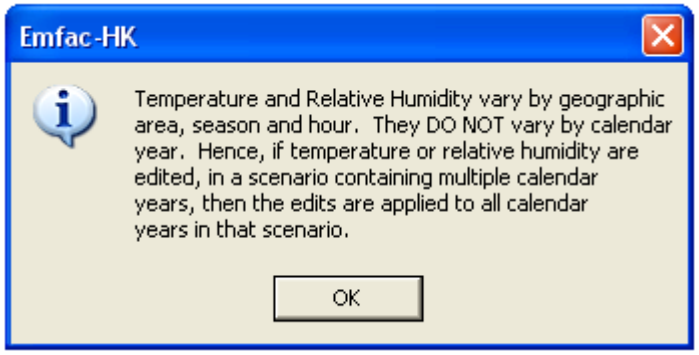


Editing Speed Profiles

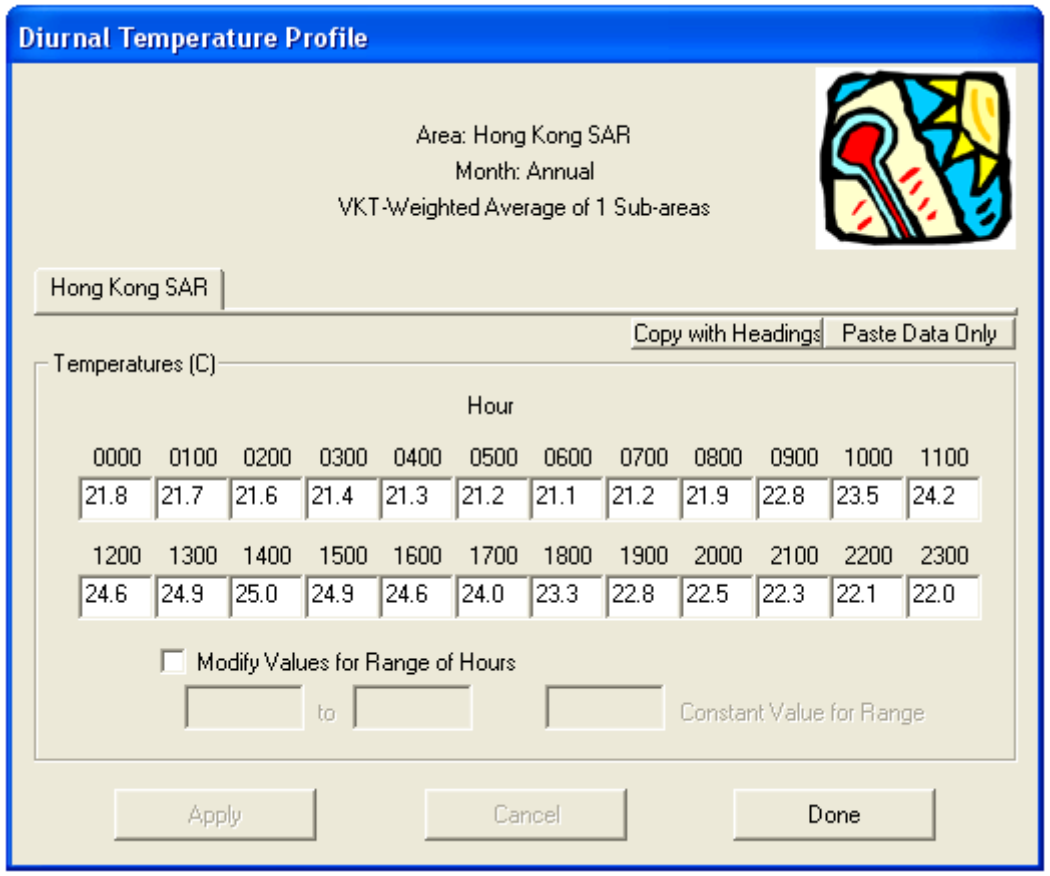


	1	2	3	4	5	6	7	8
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0589
5	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980	0.1053
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.1993	0.1993	0.1993	0.1993	0.1993	0.1993	0.1993	0.2072
8	0.0603	0.0603	0.0603	0.0603	0.0603	0.0603	0.0603	0.0748
9	0.2731	0.2731	0.2731	0.2731	0.2731	0.2731	0.2731	0.2670
10	0.1817	0.1817	0.1817	0.1817	0.1817	0.1817	0.1817	0.1692
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.1203	0.1203	0.1203	0.1203	0.1203	0.1203	0.1203	0.1026
14	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0150
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

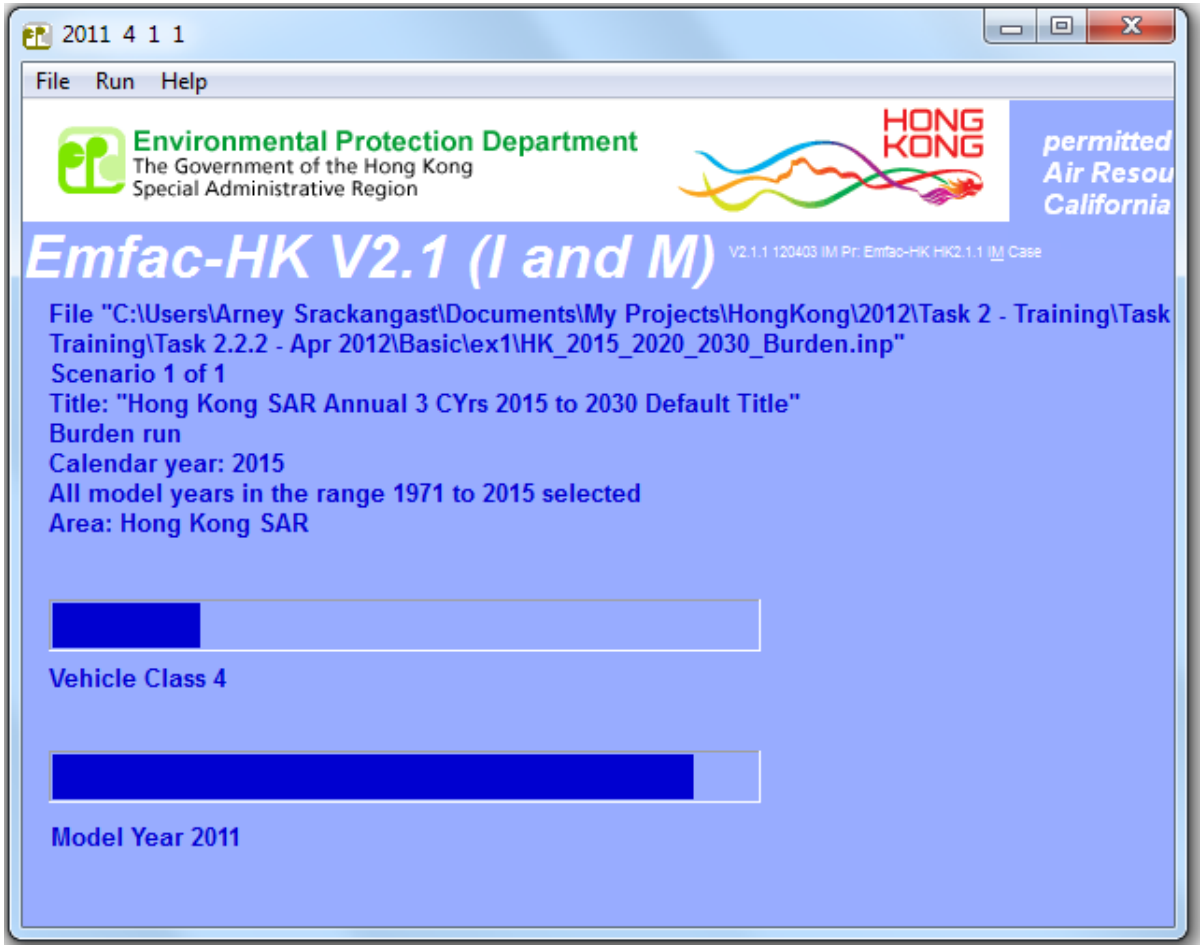
Info Message for ‘Profiles’ Option for Temperatures and Relative Humidity



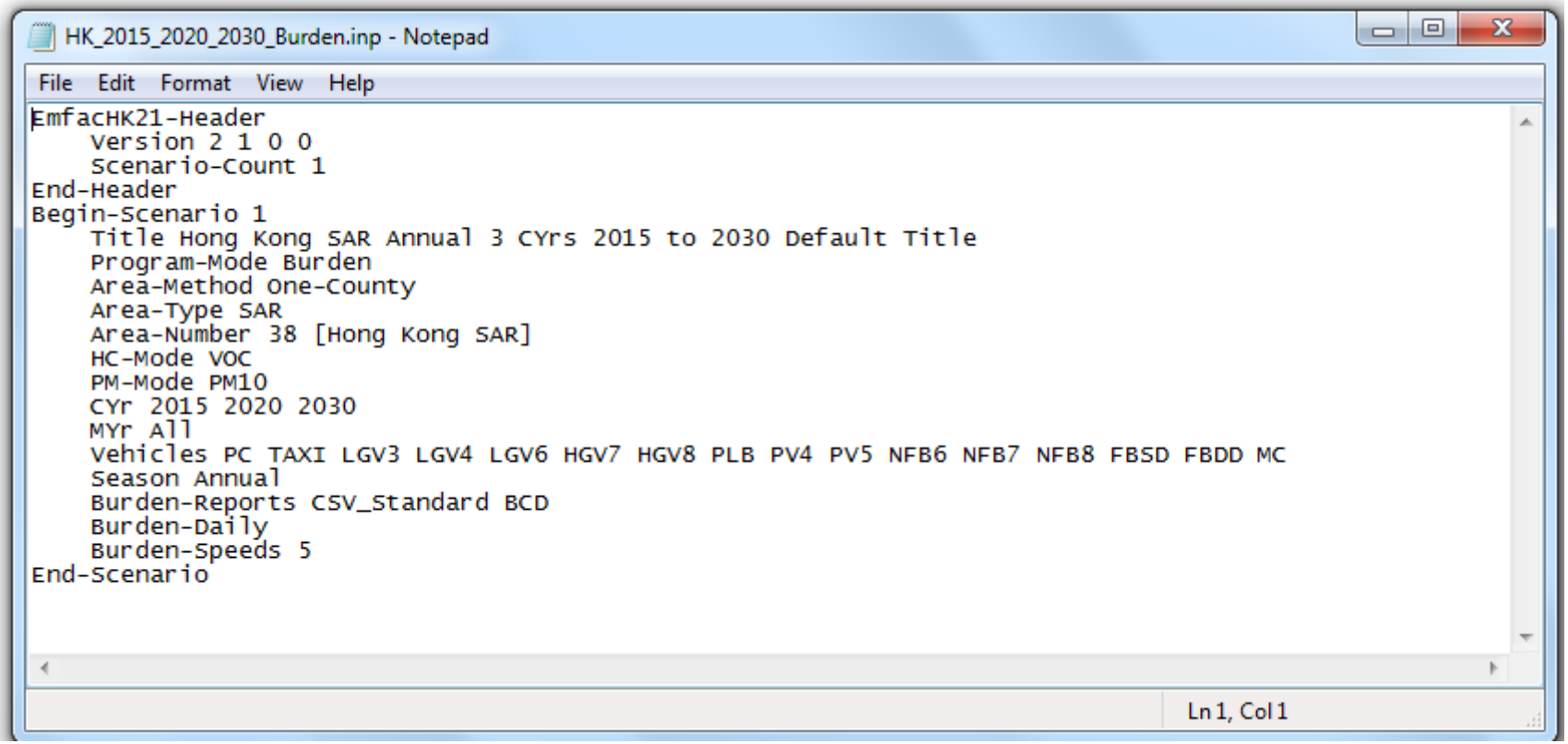
Editing Temperature Profile



Final Run or Progress Screen



EMFAC-HK Version 2.1
Example Input File


HK_2015_2020_2030_Burden.inp - Notepad

File Edit Format View Help

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End-Header
Begin-Scenario 1
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    Program-Mode Burden
    Area-Method One-County
    Area-Type SAR
    Area-Number 38 [Hong Kong SAR]
    HC-Mode VOC
    PM-Mode PM10
    CYr 2015 2020 2030
    MYr All
    Vehicles PC TAXI LGV3 LGV4 LGV6 HGV7 HGV8 PLB PV4 PV5 NFB6 NFB7 NFB8 FBSD FBDD MC
    Season Annual
    Burden-Reports CSV_Standard BCD
    Burden-Daily
    Burden-Speeds 5
End-Scenario
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Ln 1, Col 1