Training Exercises

Exercise Setup

- Folders for each Exercise
- Save input/output to folders for each Exercise
- Exercises require MS Office 2007 or above (Excel).

Exercise Overview

Basic

1. Burden mode
2. Emfac mode
3. Exhasut Technology Group (TG) fraction
4. Vehicle Kilometer Travelled (VKT)
5. Trips
6. Speed fraction
7. Relative Humidity

Advance

8. Alternate Base Year
9. Bus retirement
10. Link example

Basic Exercises

Exercise #1: Daily Emissions Inventory

- This exercise will generate an average daily emissions inventory for Hong Kong at calendar year 2030 using BURDEN output formats

- Require 1 scenario for calendar year 2030

- Save input file as: HK_2030_Burden.inp

Exercise #1: Scenario input data

- Geographic Area: Hong Kong SAR (default)
- Calendar Years: 2030
- Alternate Baseline Year: Inactive (default)
- Season: Annual (default)
- Scenario Title for Reports: Default Title
- Model Years: All (default)
- Vehicle Classes: Modify (default)

Exercise #1: Scenario input data

- Scenario Type:

BURDEN – Area Emission Estimates

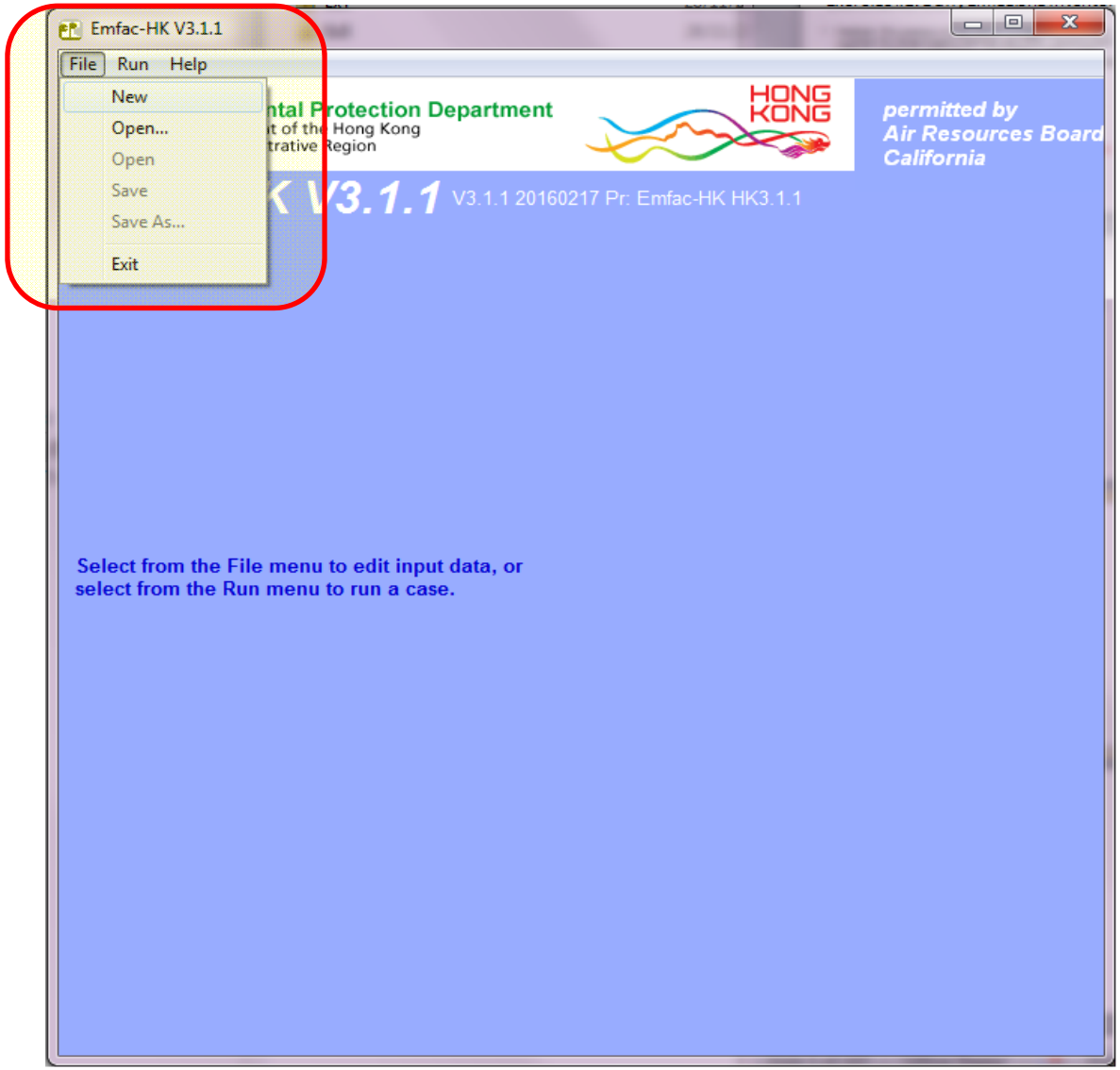
- Files and Reports:

1) Detailed Planning Inventory (CSV) (default)
2) MVEI7G (BCD)
3) Detailed Outputs (BDN)

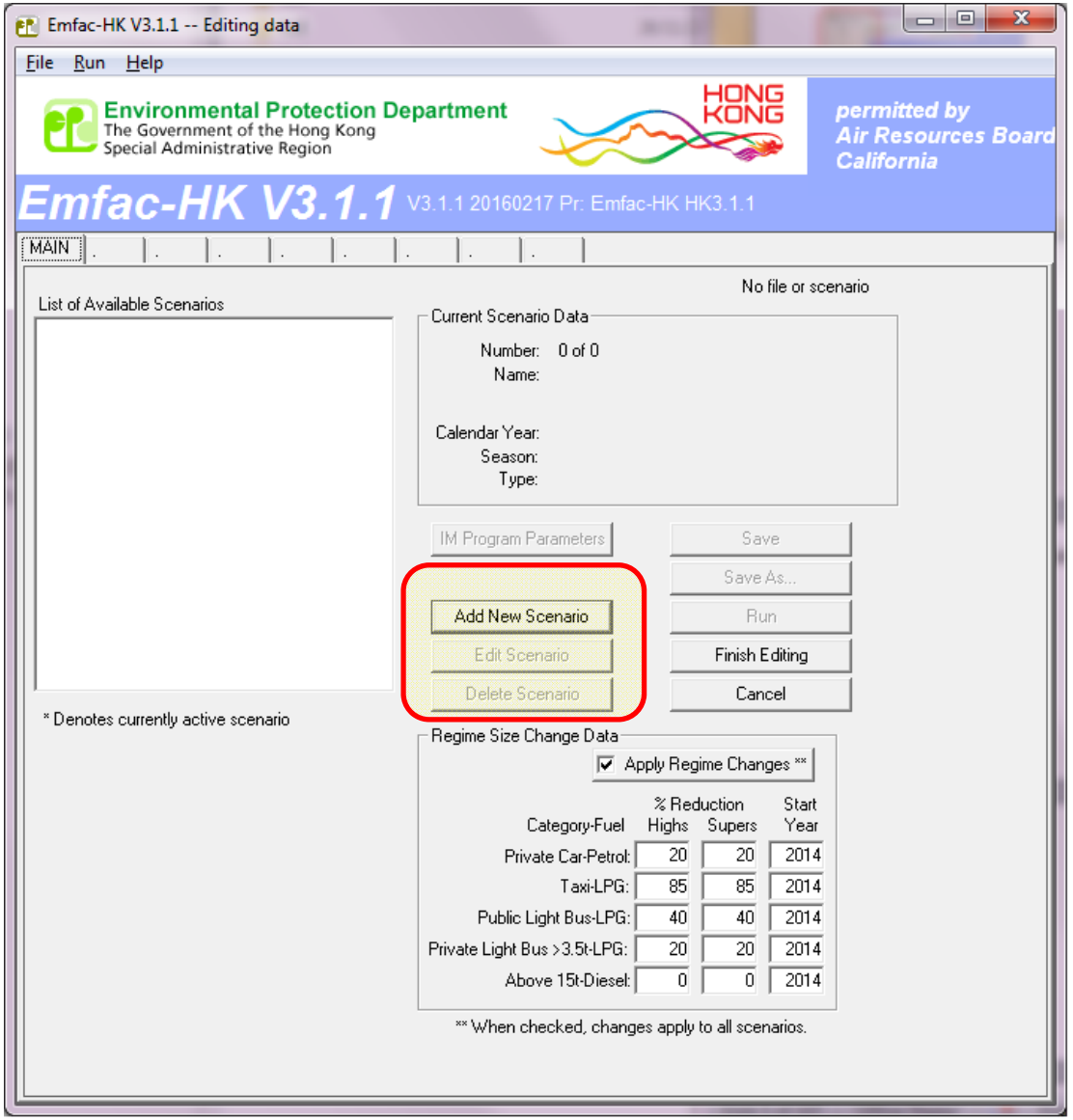
    - check Model Yrs & Tech Groups

- Output Frequency: Day (default)
- Output Particulate: PM_{10} (default)
- Output Hydrocarbons: VOC (default)

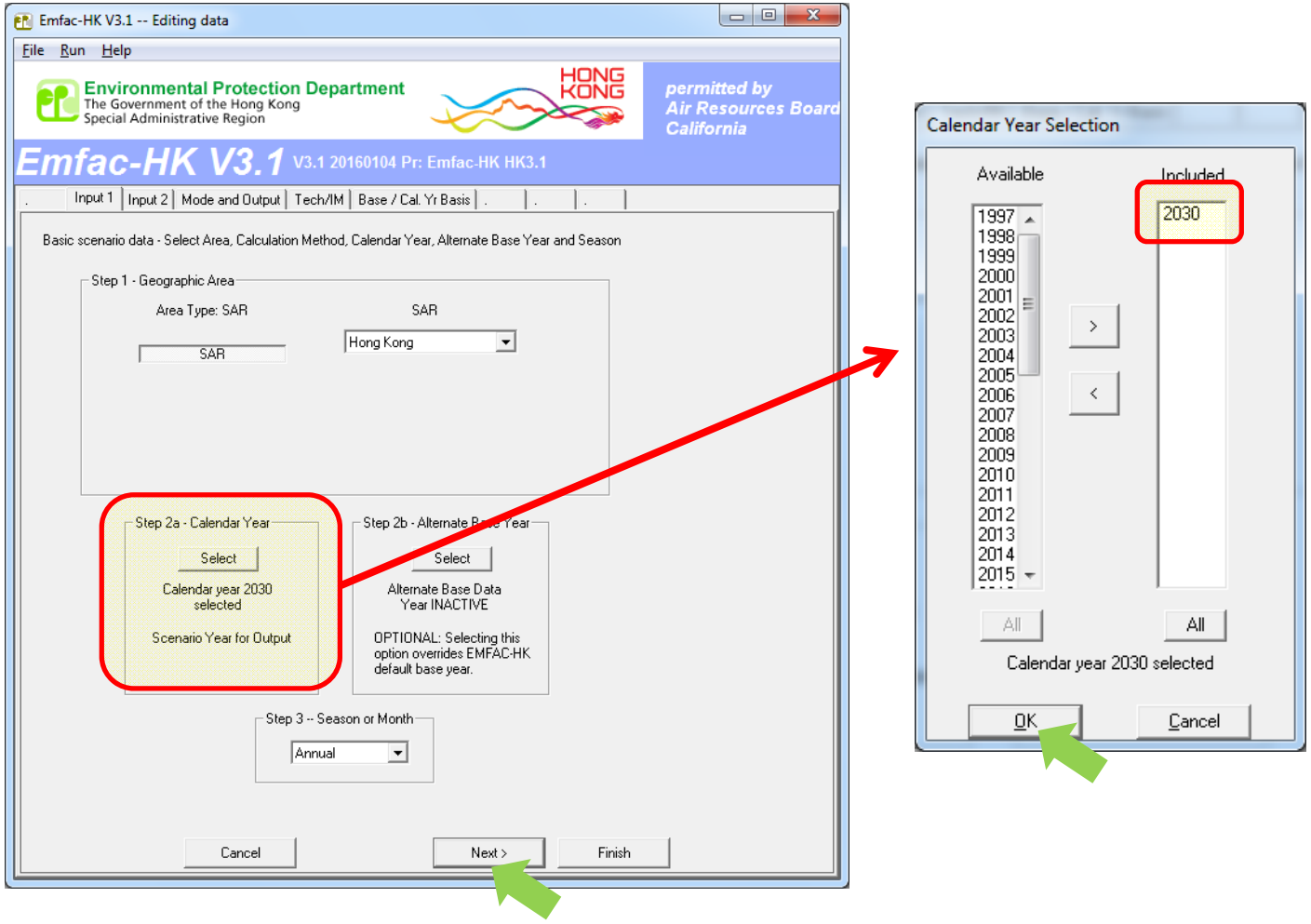
Exercise #1: New File



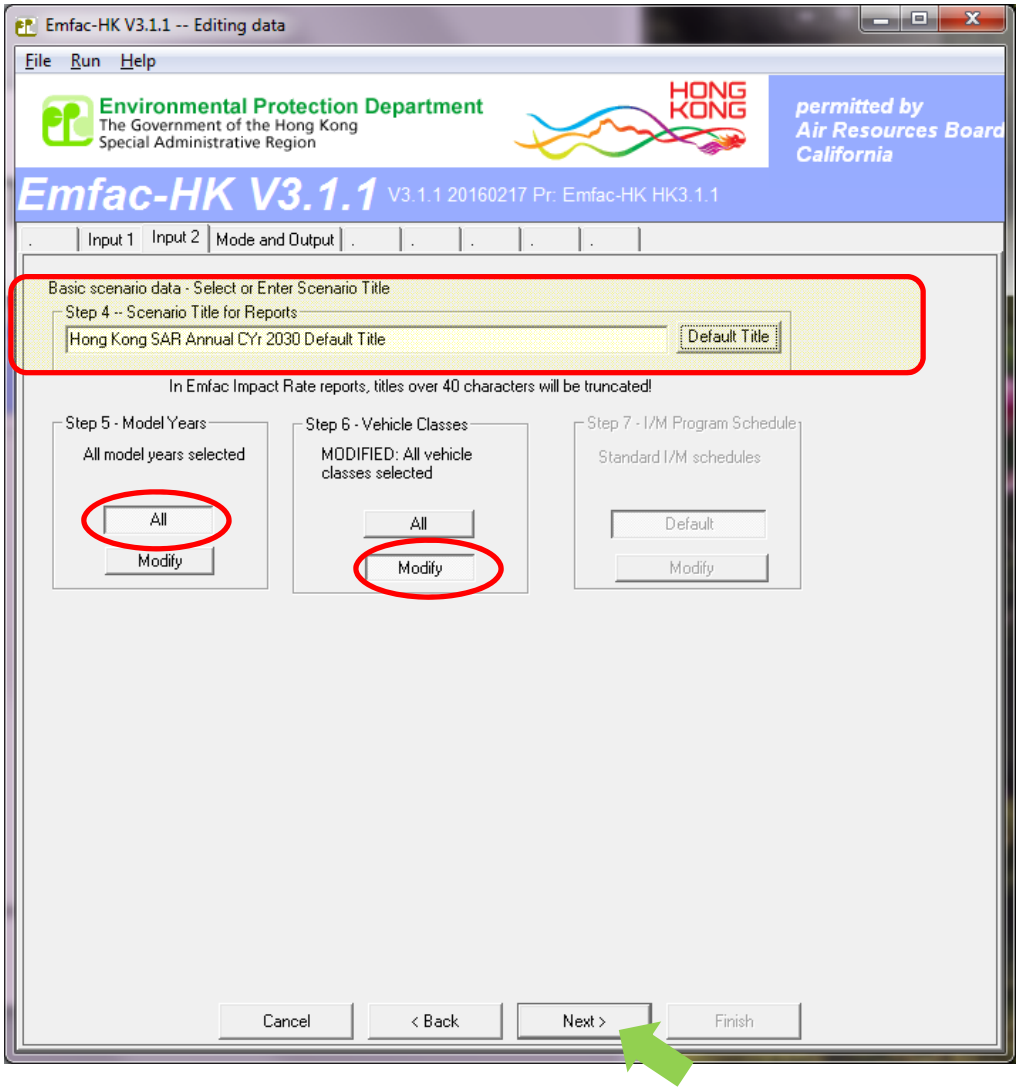
Exercise #1: Add New Scenario



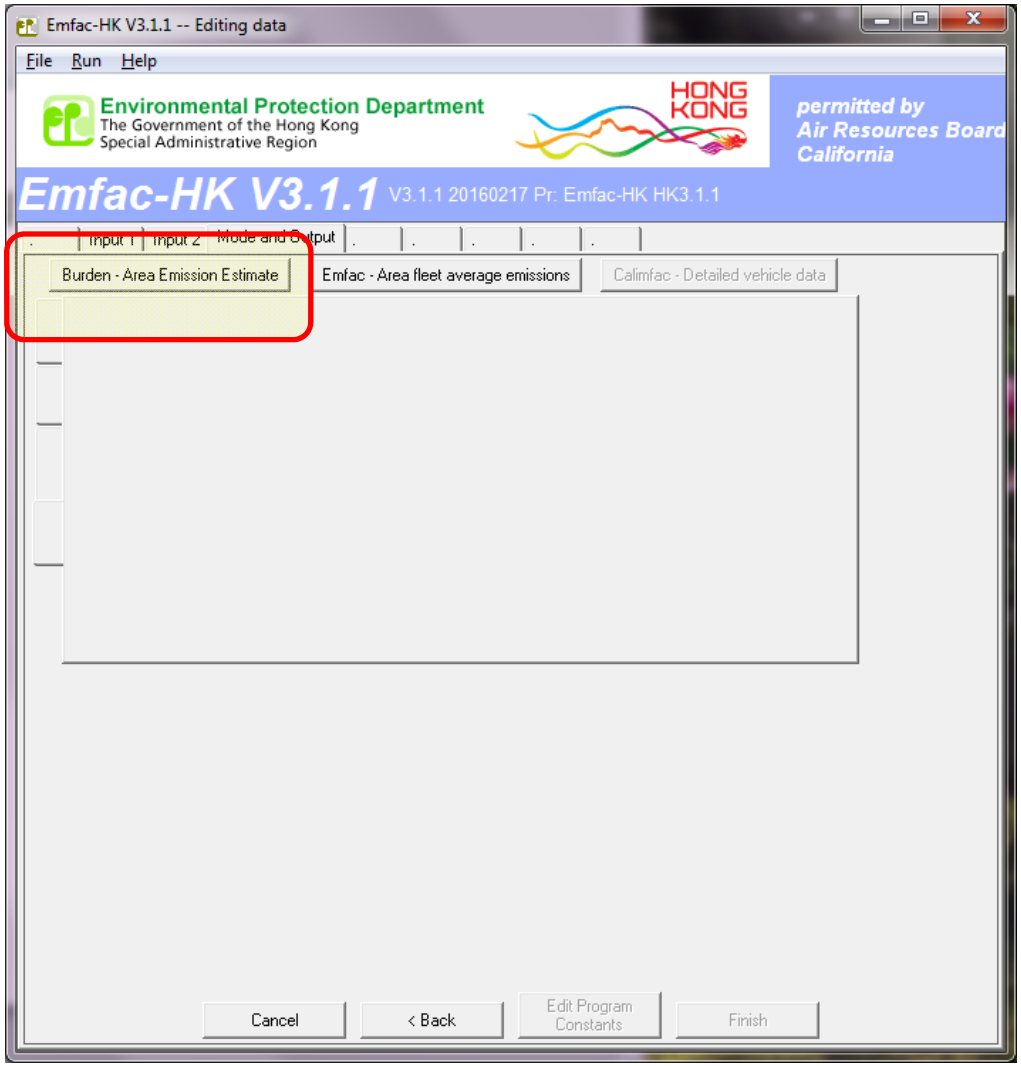
Exercise #1: Input 1 Tab



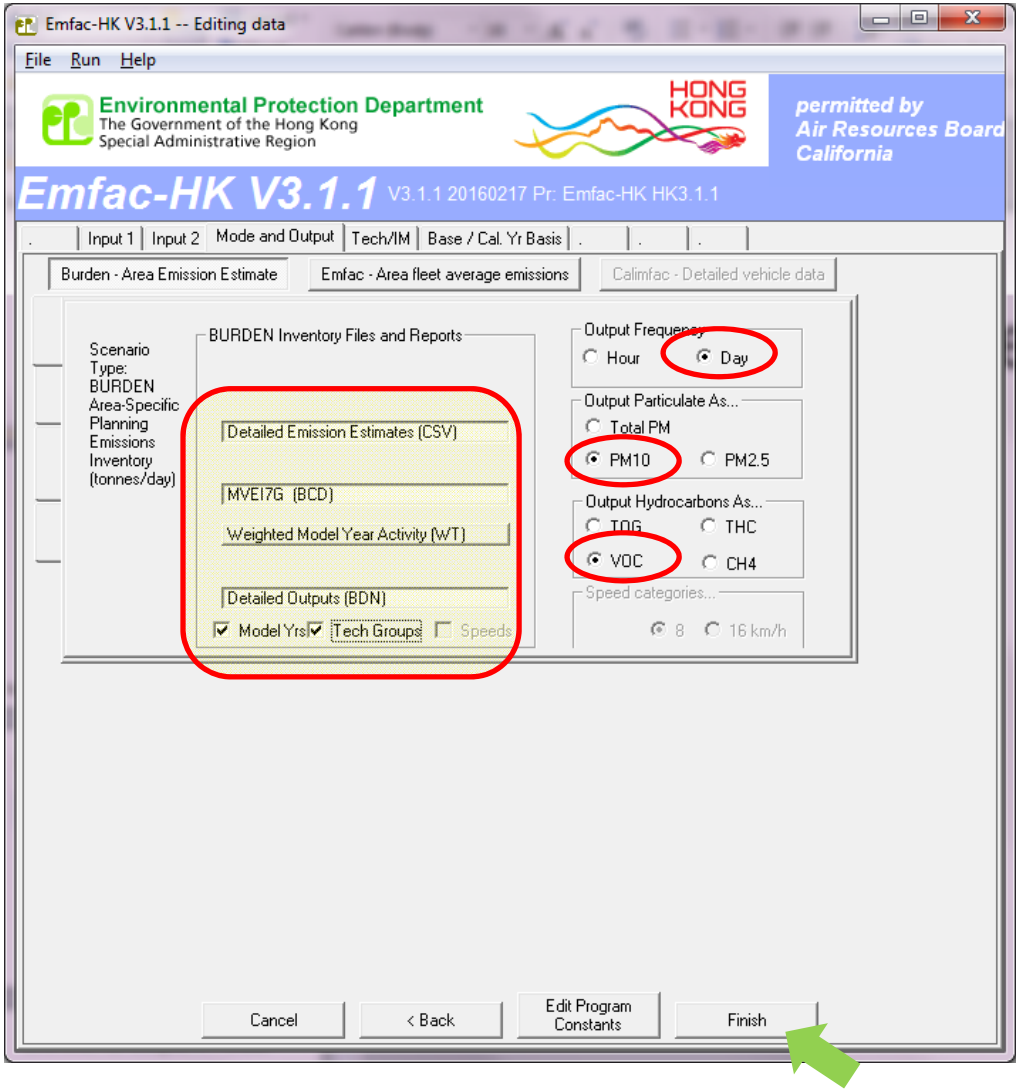
Exercise #1: Input 2 Tab



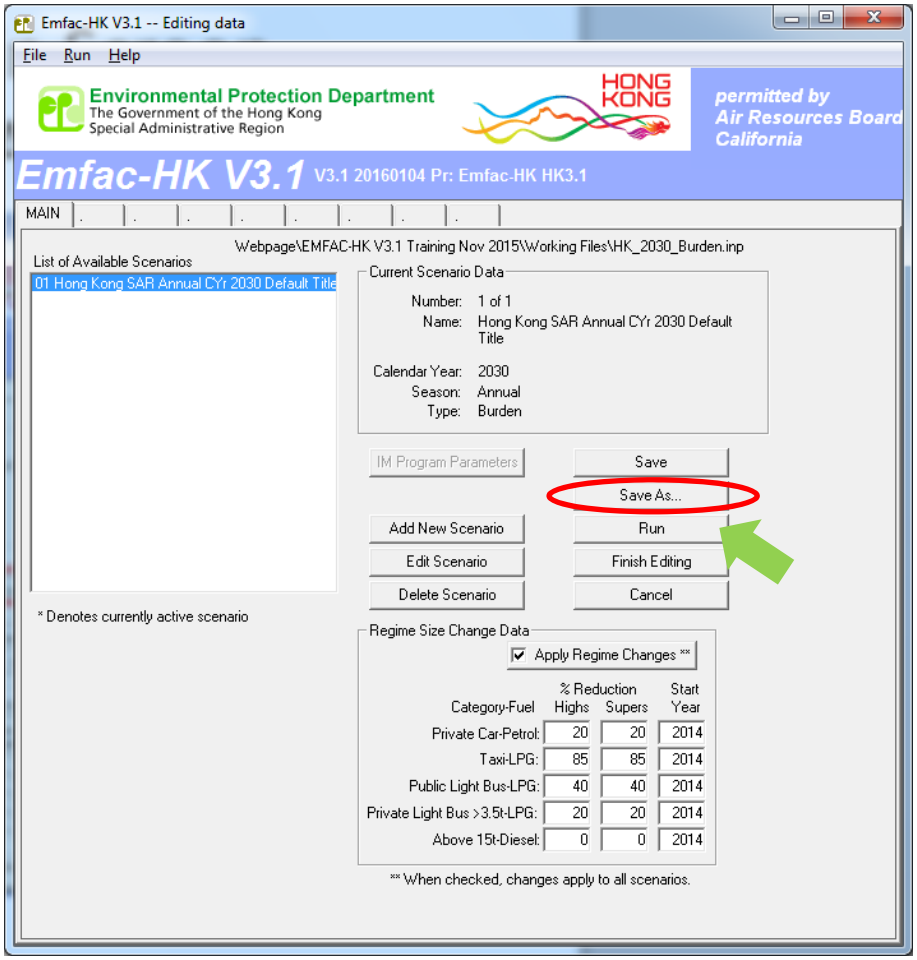
Exercise #1: Mode and Output Tab



Exercise #1: Mode and Output Tab

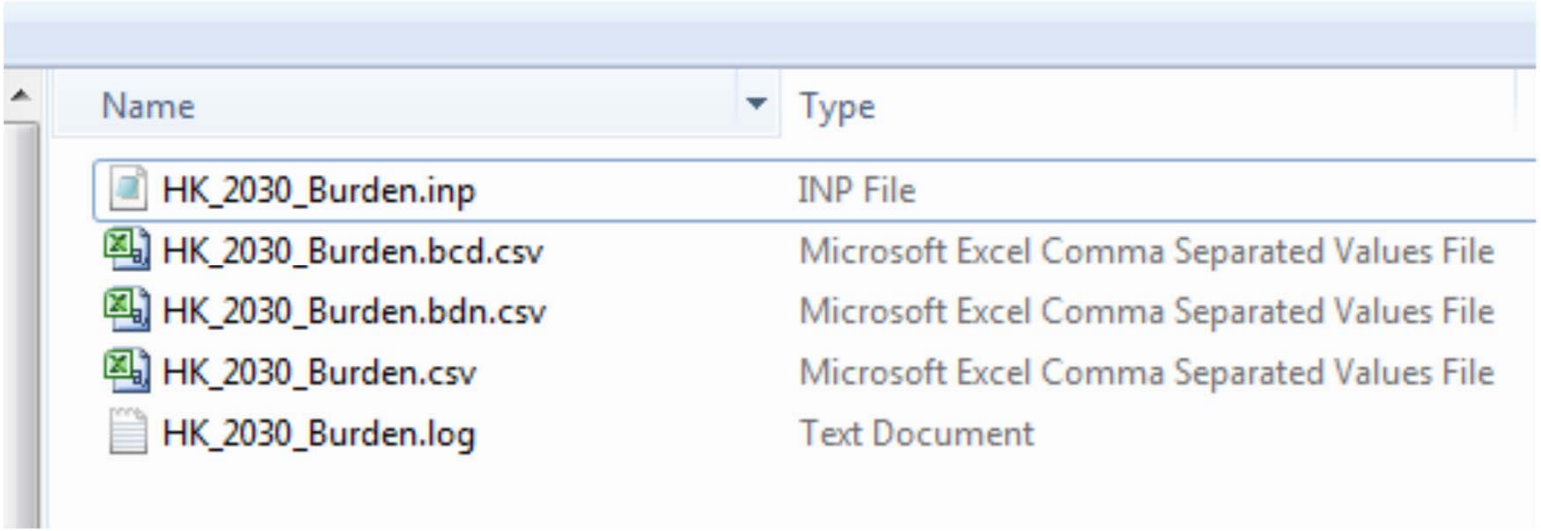


Exercise #1: Main Screen

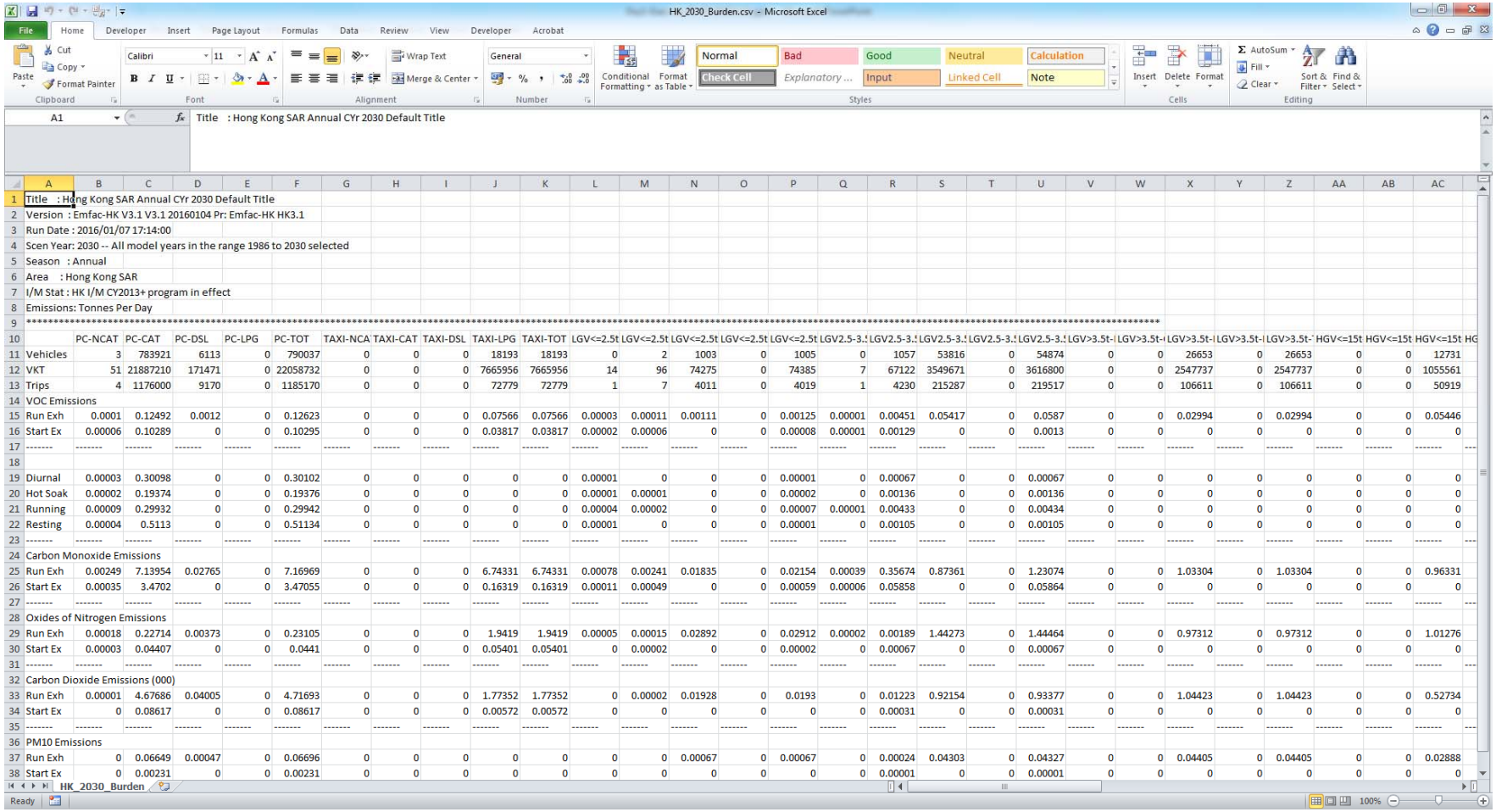


- Save input file as: HK_2030_Burden.inp and Run

Exercise #1: Output in Folder



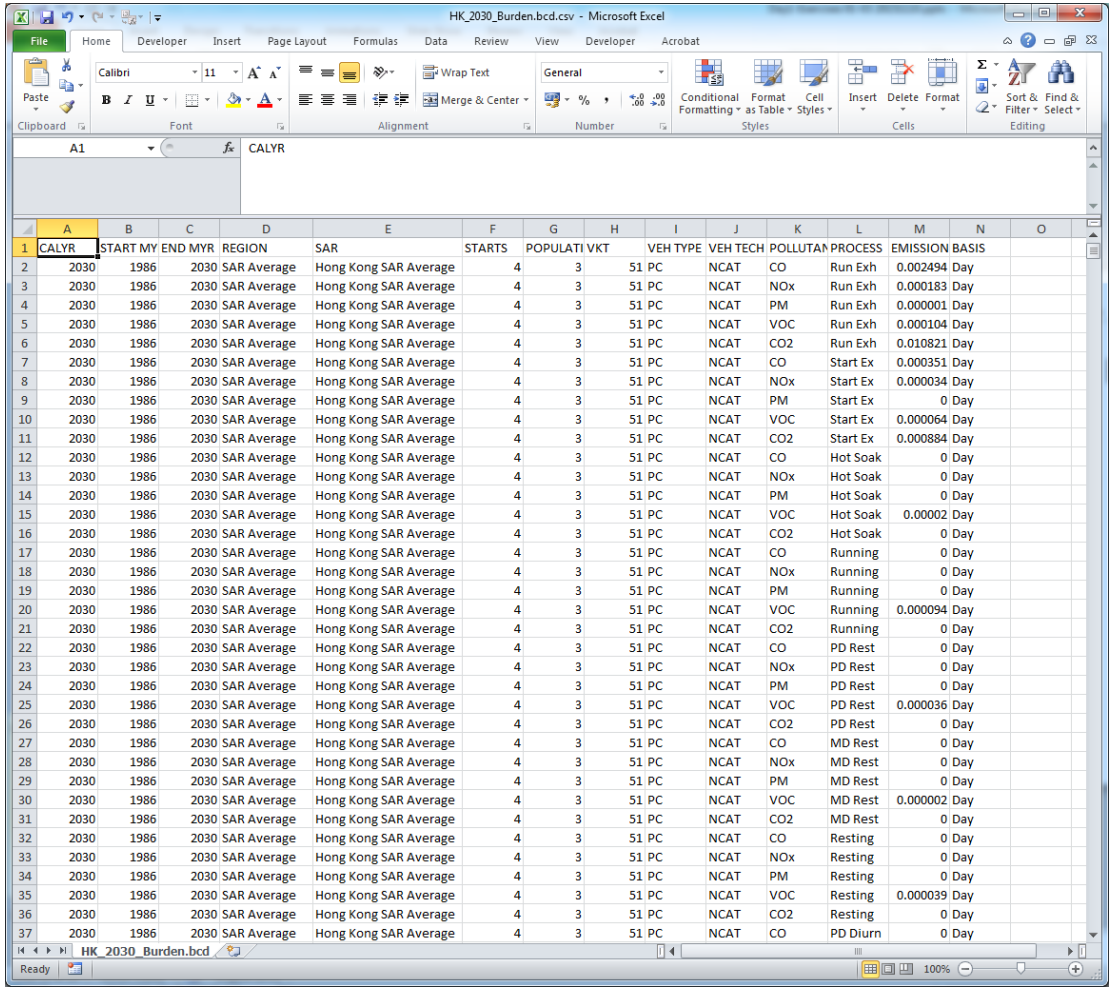
Exercise #1: HK_2030_Burden.csv



HK_2030_Burden.csv - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	Title : Hong Kong SAR Annual CYr 2030 Default Title																												
2	Version : Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1																												
3	Run Date : 2016/01/07 17:14:00																												
4	Scen Year: 2030 -- All model years in the range 1986 to 2030 selected																												
5	Season : Annual																												
6	Area : Hong Kong SAR																												
7	I/M Stat : HK I/M CY2013+ program in effect																												
8	Emissions: Tonnes Per Day																												
9	**********																												
10		PC-NCAT	PC-CAT	PC-DSL	PC-LPG	PC-TOT	TAXI-NCA	TAXI-CAT	TAXI-DSL	TAXI-LPG	TAXI-TOT	LGV<=2.5t	LGV<=2.5t	LGV<=2.5t	LGV<=2.5t	LGV2.5-3.5	LGV2.5-3.5	LGV2.5-3.5	LGV2.5-3.5	LGV2.5-3.5	LGV>3.5t-l	LGV>3.5t-l	LGV>3.5t-l	LGV>3.5t-l	LGV>3.5t-	HGV<=15t	HGV<=15t	HGV<=15t	HG
11	Vehicles	3	783921	6113	0	790037	0	0	0	18193	18193	0	2	1003	0	1005	0	1057	53816	0	54874	0	0	26653	0	26653	0	0	12731
12	VKT	51	21887210	171471	0	22058732	0	0	0	7665956	7665956	14	96	74275	0	74385	7	67122	3549671	0	3616800	0	0	2547737	0	2547737	0	0	1055561
13	Trips	4	1176000	9170	0	1185170	0	0	0	72779	72779	1	7	4011	0	4019	1	4230	215287	0	219517	0	0	106611	0	106611	0	0	50919
14	VOC Emissions																												
15	Run Exh	0.0001	0.12492	0.0012	0	0.12623	0	0	0	0.07566	0.07566	0.00003	0.00011	0.00111	0	0.00125	0.00001	0.00451	0.05417	0	0.0587	0	0	0.02994	0	0.02994	0	0	0.05446
16	Start Ex	0.00006	0.10289	0	0	0.10295	0	0	0	0.03817	0.03817	0.00002	0.00006	0	0	0.00008	0.00001	0.00129	0	0	0.0013	0	0	0	0	0	0	0	0
17	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
18																													
19	Diurnal	0.00003	0.30098	0	0	0.30102	0	0	0	0	0	0.00001	0	0	0	0.00001	0	0.00067	0	0	0.00067	0	0	0	0	0	0	0	0
20	Hot Soak	0.00002	0.19374	0	0	0.19376	0	0	0	0	0	0.00001	0.00001	0	0	0.00002	0	0.00136	0	0	0.00136	0	0	0	0	0	0	0	0
21	Running	0.00009	0.29932	0	0	0.29942	0	0	0	0	0	0.00004	0.00002	0	0	0.00007	0.00001	0.00433	0	0	0.00434	0	0	0	0	0	0	0	0
22	Resting	0.00004	0.5113	0	0	0.51134	0	0	0	0	0	0.00001	0	0	0	0.00001	0	0.00105	0	0	0.00105	0	0	0	0	0	0	0	0
23	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
24	Carbon Monoxide Emissions																												
25	Run Exh	0.00249	7.13954	0.02765	0	7.16969	0	0	0	6.74331	6.74331	0.00078	0.00241	0.01835	0	0.02154	0.00039	0.35674	0.87361	0	1.23074	0	0	1.03304	0	1.03304	0	0	0.96331
26	Start Ex	0.00035	3.4702	0	0	3.47055	0	0	0	0.16319	0.16319	0.00011	0.00049	0	0	0.00059	0.00006	0.05858	0	0	0.05864	0	0	0	0	0	0	0	0
27	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
28	Oxides of Nitrogen Emissions																												
29	Run Exh	0.00018	0.22714	0.00373	0	0.23105	0	0	0	1.9419	1.9419	0.00005	0.00015	0.02892	0	0.02912	0.00002	0.00189	1.44273	0	1.44464	0	0	0.97312	0	0.97312	0	0	1.01276
30	Start Ex	0.00003	0.04407	0	0	0.0441	0	0	0	0.05401	0.05401	0	0.00002	0	0	0.00002	0	0.00067	0	0	0.00067	0	0	0	0	0	0	0	0
31	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
32	Carbon Dioxide Emissions (000)																												
33	Run Exh	0.00001	4.67686	0.04005	0	4.71693	0	0	0	1.77352	1.77352	0	0.00002	0.01928	0	0.0193	0	0.01223	0.92154	0	0.93377	0	0	1.04423	0	1.04423	0	0	0.52734
34	Start Ex	0	0.08617	0	0	0.08617	0	0	0	0.00572	0.00572	0	0	0	0	0	0	0.00031	0	0	0.00031	0	0	0	0	0	0	0	0
35	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
36	PM10 Emissions																												
37	Run Exh	0	0.06649	0.00047	0	0.06696	0	0	0	0	0	0	0	0.00067	0	0.00067	0	0.00024	0.04303	0	0.04327	0	0	0.04405	0	0.04405	0	0	0.02888
38	Start Ex	0	0.00231	0	0	0.00231	0	0	0	0	0	0	0	0	0	0	0	0.00001	0	0	0.00001	0	0	0	0	0	0	0	0

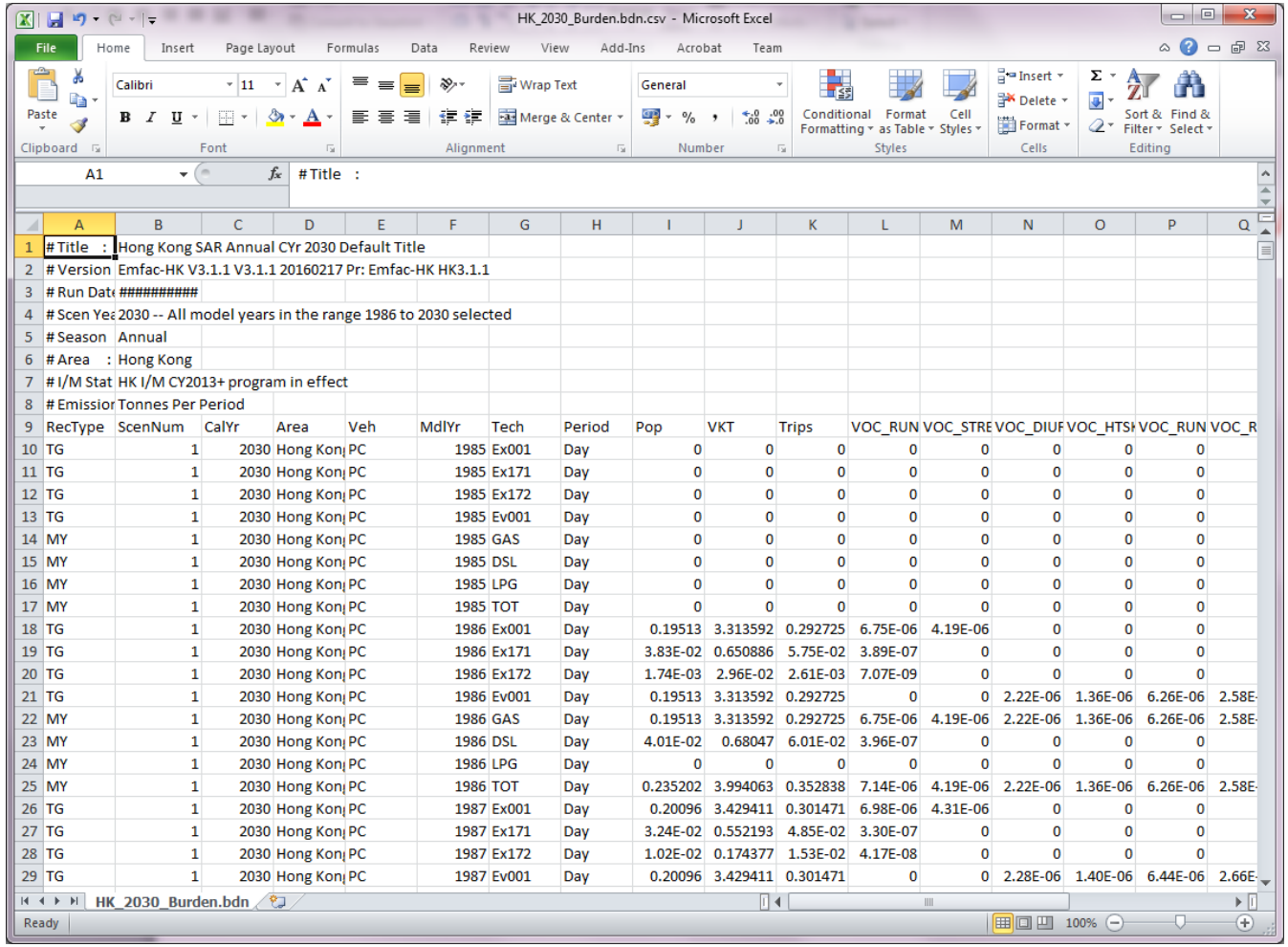
Exercise #1: HK_2030_Burden.bcd.csv



HK_2030_Burden.bcd.csv - Microsoft Excel

CALYR	START MY	END MYR	REGION	SAR	STARTS	POPULATI	VKT	VEH TYPE	VEH TECH	POLLUTAN	PROCESS	EMISSION	BASIS
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Run Exh	0.002494	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Run Exh	0.000183	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Run Exh	0.000001	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Run Exh	0.000104	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Run Exh	0.010821	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Start Ex	0.000351	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Start Ex	0.000034	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Start Ex	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Start Ex	0.000064	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Start Ex	0.000884	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Hot Soak	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Hot Soak	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Hot Soak	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Hot Soak	0.00002	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Hot Soak	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Running	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Running	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Running	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Running	0.000094	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Running	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	PD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	PD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	PD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	PD Rest	0.000036	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	PD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	MD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	MD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	MD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	MD Rest	0.000002	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	MD Rest	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Resting	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Resting	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Resting	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Resting	0.000039	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Resting	0	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	PD Diurn	0	Day

Exercise #1: HK_2030_Burden.bdn.csv



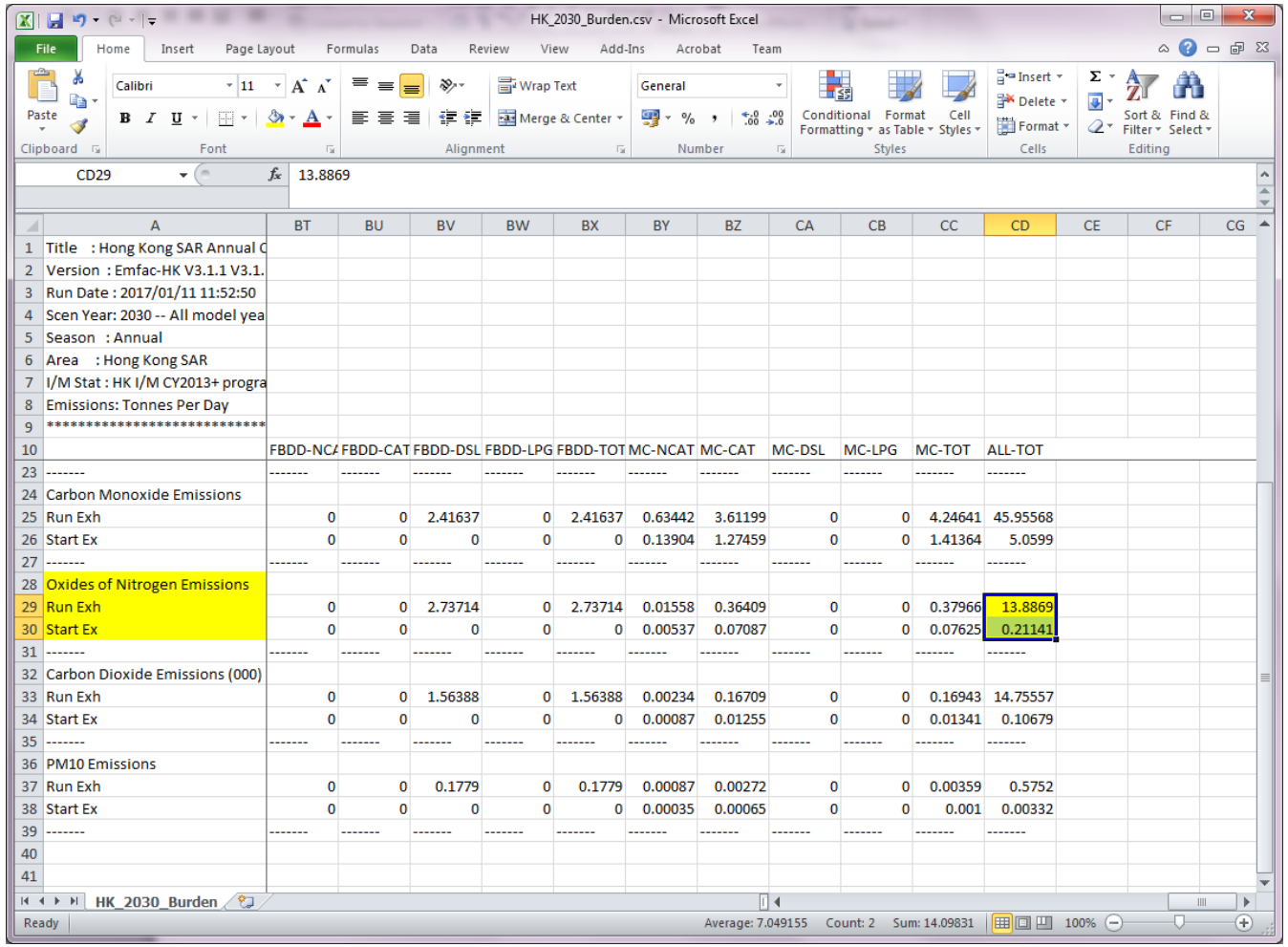
HK_2030_Burden.bdn.csv - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	# Title :	Hong Kong SAR Annual CYr 2030 Default Title															
2	# Version	Emfac-HK V3.1.1 V3.1.1 20160217 Pr: Emfac-HK HK3.1.1															
3	# Run Dat	##########															
4	# Scen Yea	2030 -- All model years in the range 1986 to 2030 selected															
5	# Season	Annual															
6	# Area :	Hong Kong															
7	# I/M Stat	HK I/M CY2013+ program in effect															
8	# Emissior	Tonnes Per Period															
9	RecType	ScenNum	CalYr	Area	Veh	MdlYr	Tech	Period	Pop	VKT	Trips	VOC_RUN	VOC_STRE	VOC_DIUF	VOC_HTSI	VOC_RUN	VOC_R
10	TG	1	2030	Hong Kon	PC	1985	Ex001	Day	0	0	0	0	0	0	0	0	
11	TG	1	2030	Hong Kon	PC	1985	Ex171	Day	0	0	0	0	0	0	0	0	
12	TG	1	2030	Hong Kon	PC	1985	Ex172	Day	0	0	0	0	0	0	0	0	
13	TG	1	2030	Hong Kon	PC	1985	Ev001	Day	0	0	0	0	0	0	0	0	
14	MY	1	2030	Hong Kon	PC	1985	GAS	Day	0	0	0	0	0	0	0	0	
15	MY	1	2030	Hong Kon	PC	1985	DSL	Day	0	0	0	0	0	0	0	0	
16	MY	1	2030	Hong Kon	PC	1985	LPG	Day	0	0	0	0	0	0	0	0	
17	MY	1	2030	Hong Kon	PC	1985	TOT	Day	0	0	0	0	0	0	0	0	
18	TG	1	2030	Hong Kon	PC	1986	Ex001	Day	0.19513	3.313592	0.292725	6.75E-06	4.19E-06	0	0	0	
19	TG	1	2030	Hong Kon	PC	1986	Ex171	Day	3.83E-02	0.650886	5.75E-02	3.89E-07	0	0	0	0	
20	TG	1	2030	Hong Kon	PC	1986	Ex172	Day	1.74E-03	2.96E-02	2.61E-03	7.07E-09	0	0	0	0	
21	TG	1	2030	Hong Kon	PC	1986	Ev001	Day	0.19513	3.313592	0.292725	0	0	2.22E-06	1.36E-06	6.26E-06	2.58E-
22	MY	1	2030	Hong Kon	PC	1986	GAS	Day	0.19513	3.313592	0.292725	6.75E-06	4.19E-06	2.22E-06	1.36E-06	6.26E-06	2.58E-
23	MY	1	2030	Hong Kon	PC	1986	DSL	Day	4.01E-02	0.68047	6.01E-02	3.96E-07	0	0	0	0	
24	MY	1	2030	Hong Kon	PC	1986	LPG	Day	0	0	0	0	0	0	0	0	
25	MY	1	2030	Hong Kon	PC	1986	TOT	Day	0.235202	3.994063	0.352838	7.14E-06	4.19E-06	2.22E-06	1.36E-06	6.26E-06	2.58E-
26	TG	1	2030	Hong Kon	PC	1987	Ex001	Day	0.20096	3.429411	0.301471	6.98E-06	4.31E-06	0	0	0	
27	TG	1	2030	Hong Kon	PC	1987	Ex171	Day	3.24E-02	0.552193	4.85E-02	3.30E-07	0	0	0	0	
28	TG	1	2030	Hong Kon	PC	1987	Ex172	Day	1.02E-02	0.174377	1.53E-02	4.17E-08	0	0	0	0	
29	TG	1	2030	Hong Kon	PC	1987	Ev001	Day	0.20096	3.429411	0.301471	0	0	2.28E-06	1.40E-06	6.44E-06	2.66E-

Exercise #1a:
Determine total NOx exhaust emissions from CSV output

- Hints:
  - Open CSV output file by Excel
  - Locate row “Run Exh” and “Start Ex” under “Oxides of Nitrogen Emissions”
  - Locate column “ALL-TOT”

Exercise #1a: Solution

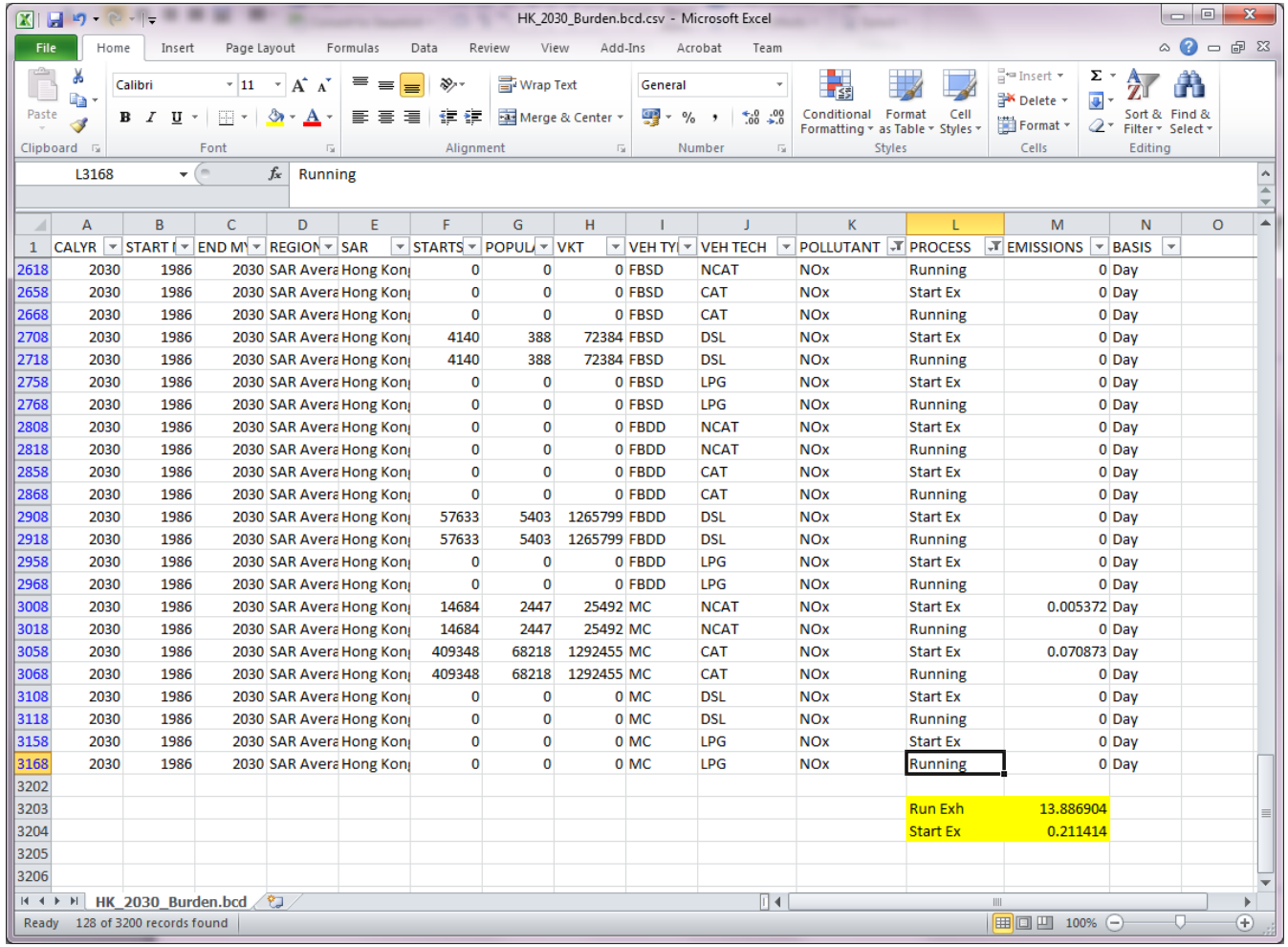


	A	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD
1	Title : Hong Kong SAR Annual C											
2	Version : Emfac-HK V3.1.1 V3.1.											
3	Run Date : 2017/01/11 11:52:50											
4	Scen Year: 2030 -- All model yea											
5	Season : Annual											
6	Area : Hong Kong SAR											
7	I/M Stat : HK I/M CY2013+ progra											
8	Emissions: Tonnes Per Day											
9	**********											
10		FBDD-NCA	FBDD-CAT	FBDD-DSL	FBDD-LPG	FBDD-TOT	MC-NCAT	MC-CAT	MC-DSL	MC-LPG	MC-TOT	ALL-TOT
23	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
24	Carbon Monoxide Emissions											
25	Run Exh	0	0	2.41637	0	2.41637	0.63442	3.61199	0	0	4.24641	45.95568
26	Start Ex	0	0	0	0	0	0.13904	1.27459	0	0	1.41364	5.0599
27	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
28	Oxides of Nitrogen Emissions											
29	Run Exh	0	0	2.73714	0	2.73714	0.01558	0.36409	0	0	0.37966	13.8869
30	Start Ex	0	0	0	0	0	0.00537	0.07087	0	0	0.07625	0.21141
31	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
32	Carbon Dioxide Emissions (000)											
33	Run Exh	0	0	1.56388	0	1.56388	0.00234	0.16709	0	0	0.16943	14.75557
34	Start Ex	0	0	0	0	0	0.00087	0.01255	0	0	0.01341	0.10679
35	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
36	PM10 Emissions											
37	Run Exh	0	0	0.1779	0	0.1779	0.00087	0.00272	0	0	0.00359	0.5752
38	Start Ex	0	0	0	0	0	0.00035	0.00065	0	0	0.001	0.00332
39	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
40												
41												

Exercise #1b:
Determine total NOx exhaust emissions from BCD output

- Hints:
  - Open BCD output file by Excel
  - Use Filter function on
    - POLLUTANT as “NOx”
    - PROCESS as “Run Exh” and “Start Ex”
  - Summation of total NOx

Exercise #1b: Solution



HK_2030_Burden.bcd.csv - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	CALYR	START	END MY	REGION	SAR	STARTS	POPUL	VKT	VEH TY	VEH TECH	POLLUTANT	PROCESS	EMISSIONS	BASIS	
2618	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	NCAT	NOx	Running	0	Day	
2658	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	CAT	NOx	Start Ex	0	Day	
2668	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	CAT	NOx	Running	0	Day	
2708	2030	1986	2030	SAR Avera	Hong Kon	4140	388	72384	FBSD	DSL	NOx	Start Ex	0	Day	
2718	2030	1986	2030	SAR Avera	Hong Kon	4140	388	72384	FBSD	DSL	NOx	Running	0	Day	
2758	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	LPG	NOx	Start Ex	0	Day	
2768	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	LPG	NOx	Running	0	Day	
2808	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	NCAT	NOx	Start Ex	0	Day	
2818	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	NCAT	NOx	Running	0	Day	
2858	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	CAT	NOx	Start Ex	0	Day	
2868	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	CAT	NOx	Running	0	Day	
2908	2030	1986	2030	SAR Avera	Hong Kon	57633	5403	1265799	FBDD	DSL	NOx	Start Ex	0	Day	
2918	2030	1986	2030	SAR Avera	Hong Kon	57633	5403	1265799	FBDD	DSL	NOx	Running	0	Day	
2958	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	LPG	NOx	Start Ex	0	Day	
2968	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	LPG	NOx	Running	0	Day	
3008	2030	1986	2030	SAR Avera	Hong Kon	14684	2447	25492	MC	NCAT	NOx	Start Ex	0.005372	Day	
3018	2030	1986	2030	SAR Avera	Hong Kon	14684	2447	25492	MC	NCAT	NOx	Running	0	Day	
3058	2030	1986	2030	SAR Avera	Hong Kon	409348	68218	1292455	MC	CAT	NOx	Start Ex	0.070873	Day	
3068	2030	1986	2030	SAR Avera	Hong Kon	409348	68218	1292455	MC	CAT	NOx	Running	0	Day	
3108	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	DSL	NOx	Start Ex	0	Day	
3118	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	DSL	NOx	Running	0	Day	
3158	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	LPG	NOx	Start Ex	0	Day	
3168	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	LPG	NOx	Running	0	Day	
3202															
3203												Run Exh	13.886904		
3204												Start Ex	0.211414		
3205															
3206															

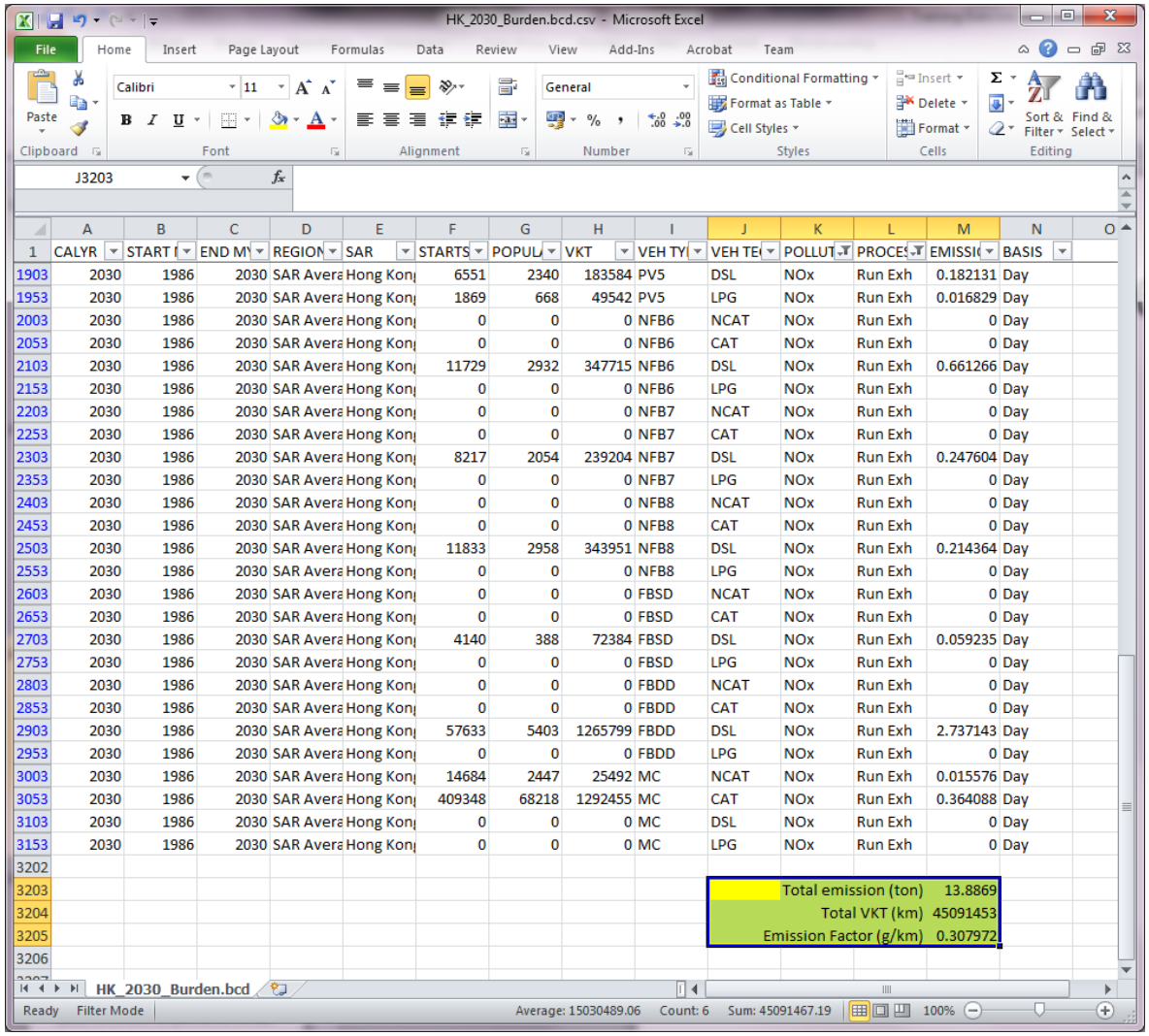
HK_2030_Burden.bcd

Ready 128 of 3200 records found 100%

Exercise #1c:
Determine Fleet-Average NOx Emissions Factor (grams/km) for all vehicle classes

- Hints:
  - Use BCD output
  - Summation of total VKT and NOx (running exhaust)
  - Divide total NOx by total VKT
  - Convert units to obtain grams/km

Exercise #1c: Solution



HK_2030_Burden.bcd.csv - Microsoft Excel

	CALYR	START	END MY	REGION	SAR	STARTS	POPUL	VKT	VEH TY	VEH TE	POLLUT	PROCES	EMISSI	BASIS
1903	2030	1986	2030	SAR Avera	Hong Kon	6551	2340	183584	PV5	DSL	NOx	Run Exh	0.182131	Day
1953	2030	1986	2030	SAR Avera	Hong Kon	1869	668	49542	PV5	LPG	NOx	Run Exh	0.016829	Day
2003	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB6	NCAT	NOx	Run Exh	0	Day
2053	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB6	CAT	NOx	Run Exh	0	Day
2103	2030	1986	2030	SAR Avera	Hong Kon	11729	2932	347715	NFB6	DSL	NOx	Run Exh	0.661266	Day
2153	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB6	LPG	NOx	Run Exh	0	Day
2203	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB7	NCAT	NOx	Run Exh	0	Day
2253	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB7	CAT	NOx	Run Exh	0	Day
2303	2030	1986	2030	SAR Avera	Hong Kon	8217	2054	239204	NFB7	DSL	NOx	Run Exh	0.247604	Day
2353	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB7	LPG	NOx	Run Exh	0	Day
2403	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB8	NCAT	NOx	Run Exh	0	Day
2453	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB8	CAT	NOx	Run Exh	0	Day
2503	2030	1986	2030	SAR Avera	Hong Kon	11833	2958	343951	NFB8	DSL	NOx	Run Exh	0.214364	Day
2553	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB8	LPG	NOx	Run Exh	0	Day
2603	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	NCAT	NOx	Run Exh	0	Day
2653	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	CAT	NOx	Run Exh	0	Day
2703	2030	1986	2030	SAR Avera	Hong Kon	4140	388	72384	FBSD	DSL	NOx	Run Exh	0.059235	Day
2753	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	LPG	NOx	Run Exh	0	Day
2803	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	NCAT	NOx	Run Exh	0	Day
2853	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	CAT	NOx	Run Exh	0	Day
2903	2030	1986	2030	SAR Avera	Hong Kon	57633	5403	1265799	FBDD	DSL	NOx	Run Exh	2.737143	Day
2953	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	LPG	NOx	Run Exh	0	Day
3003	2030	1986	2030	SAR Avera	Hong Kon	14684	2447	25492	MC	NCAT	NOx	Run Exh	0.015576	Day
3053	2030	1986	2030	SAR Avera	Hong Kon	409348	68218	1292455	MC	CAT	NOx	Run Exh	0.364088	Day
3103	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	DSL	NOx	Run Exh	0	Day
3153	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	LPG	NOx	Run Exh	0	Day

Total emission (ton)	13.8869
Total VKT (km)	45091453
Emission Factor (g/km)	0.307972

HK_2030_Burden.bcd

Ready Filter Mode Average: 15030489.06 Count: 6 Sum: 45091467.19 100%

Exercise #2: EMFAC Mode

- This exercise will generate fleet-average emission factors (grams/hour or grams/km) for temperature 25°C and relative humidity 40% at calendar year 2030.

- Temperature, relative humidity and average speed combination as specified by the user.

Exercise #2: Scenario input data

- Geographic Area: Hong Kong SAR (default)
- Calendar Years: 2030
- Alternate Baseline Year: Inactive (default)
- Season: Annual (default)
- Scenario Title for Reports: Default Title
- Model Years: All (default)
- Vehicle Classes: Modify (default)

Exercise #2: Scenario input data

- Scenario Type:

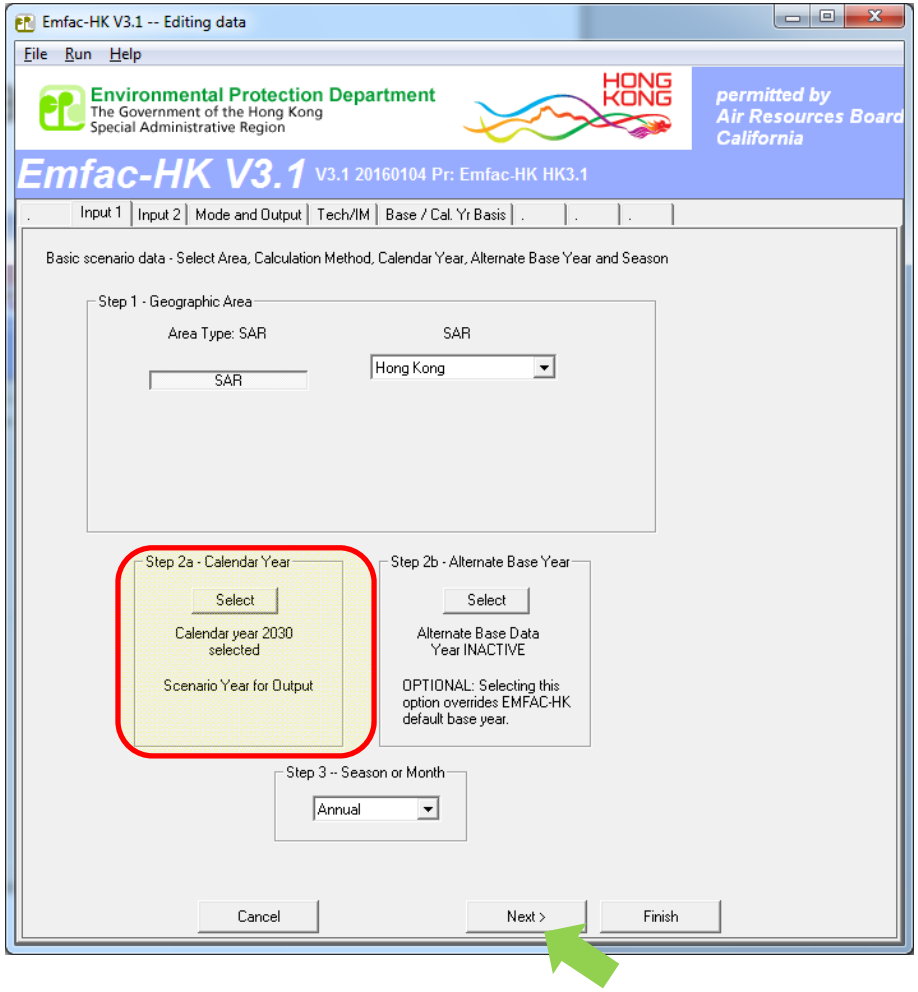
EMFAC – Area fleet average emissions

- Files and Reports:

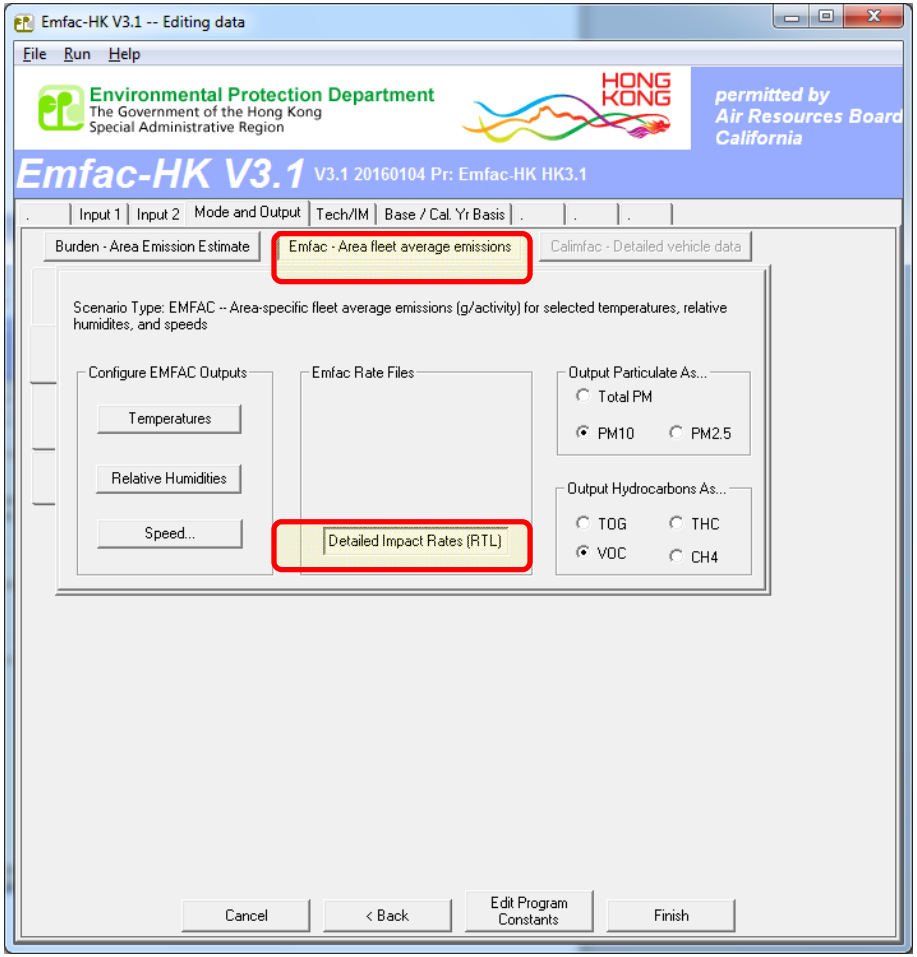
Detailed Impact Rates (RTL) (default)

- Output Particulate: PM_{10} (default)
- Output Hydrocarbons: VOC (default)
- Temperatures: 25°C
- Relative Humidity: 40%

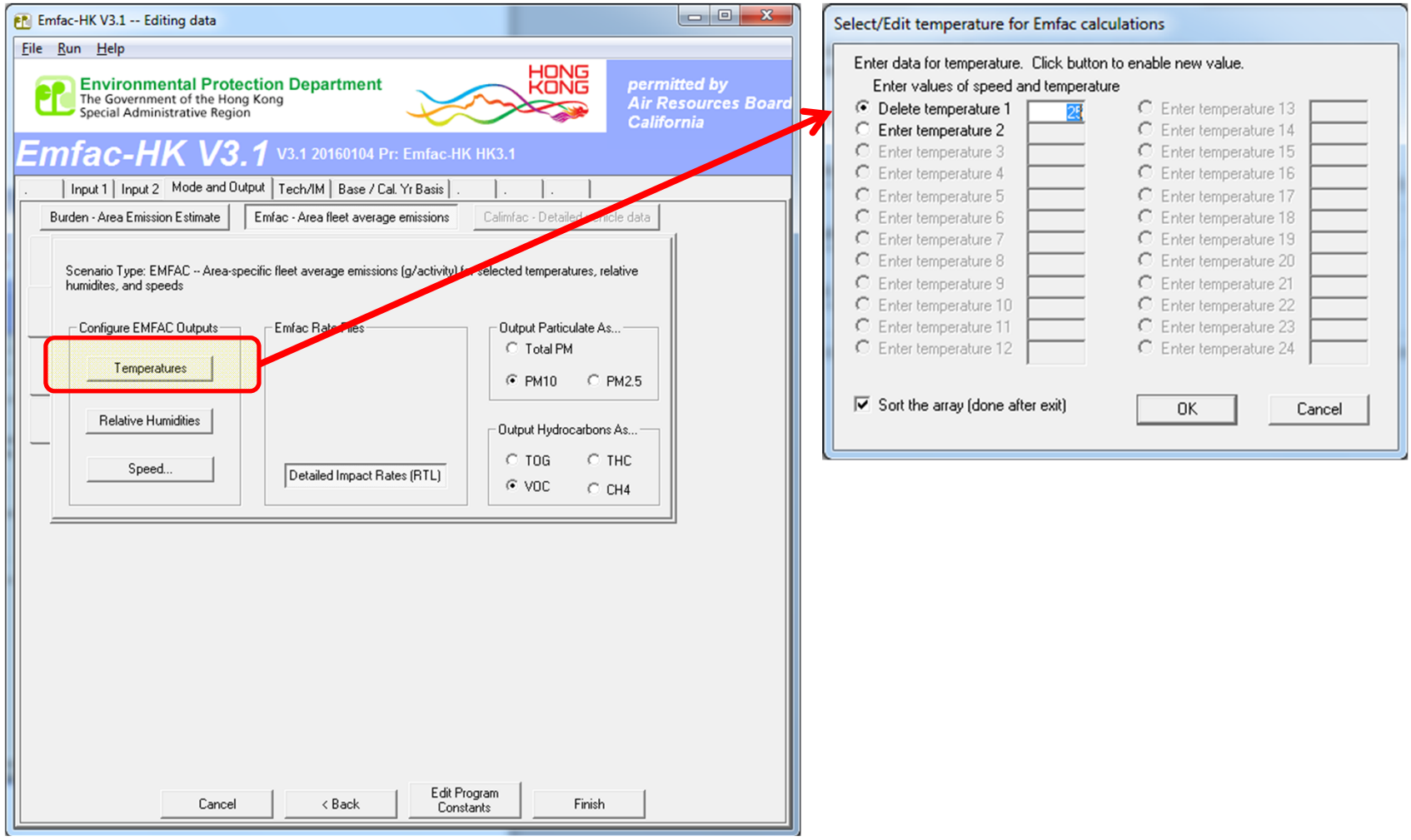
Exercise #2: Input 1 Tab



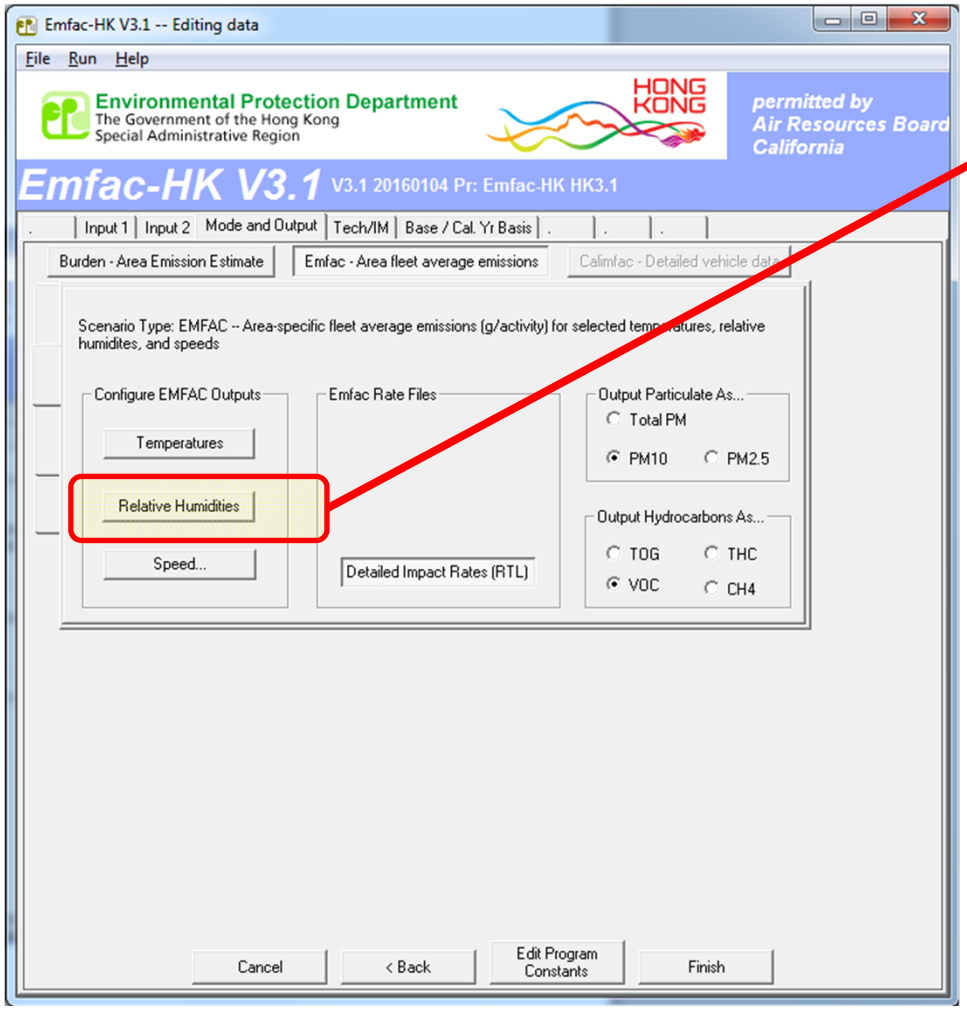
Exercise #2: Mode and Output Tab

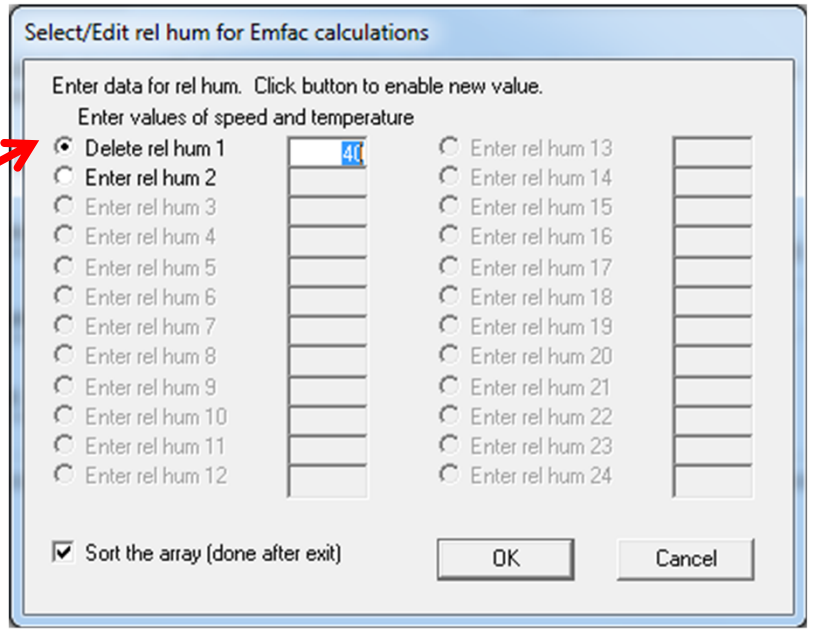


Exercise #2: Select/Edit Temperature (delete until just 1. set to 25°C)

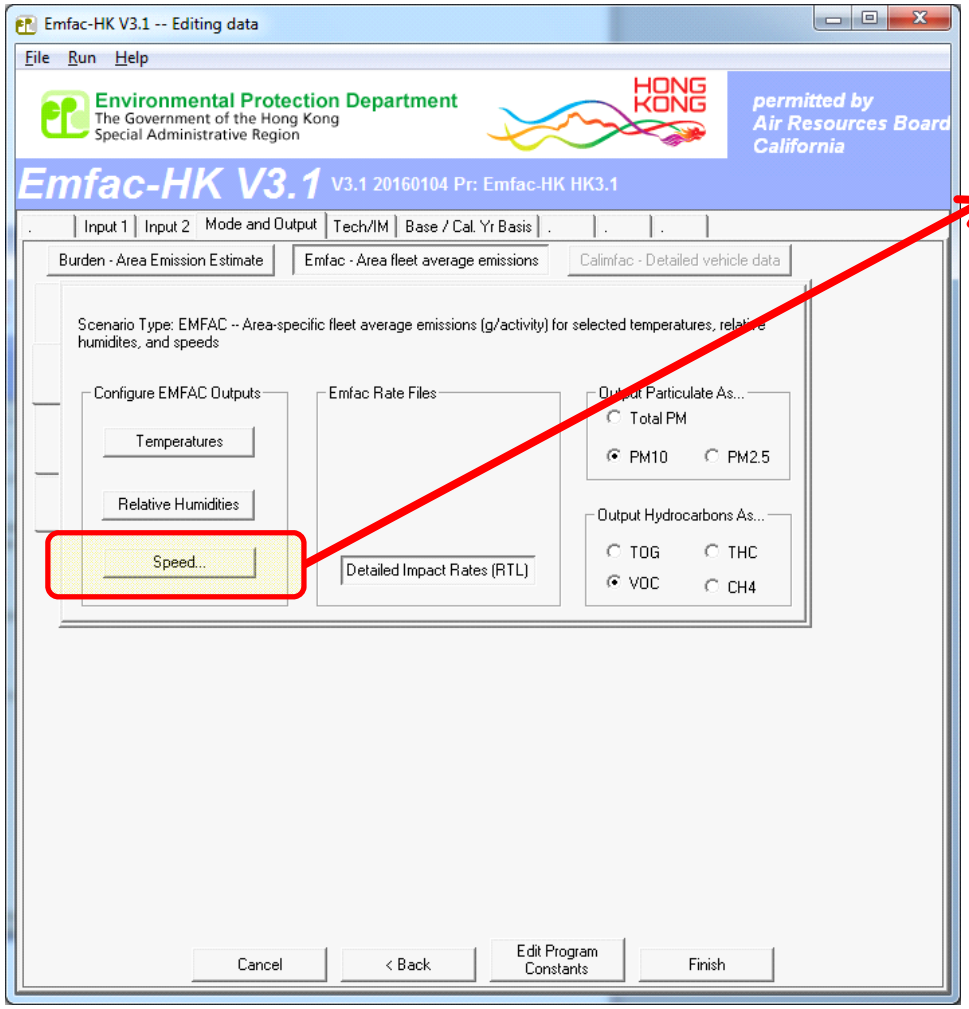


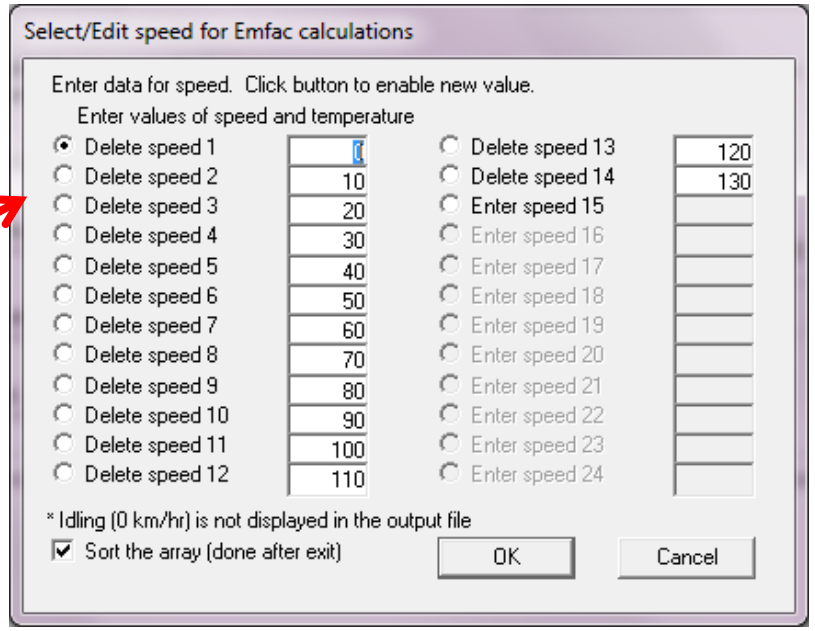
Exercise #2: Select/Edit RH (delete until just 1. set to 40%)





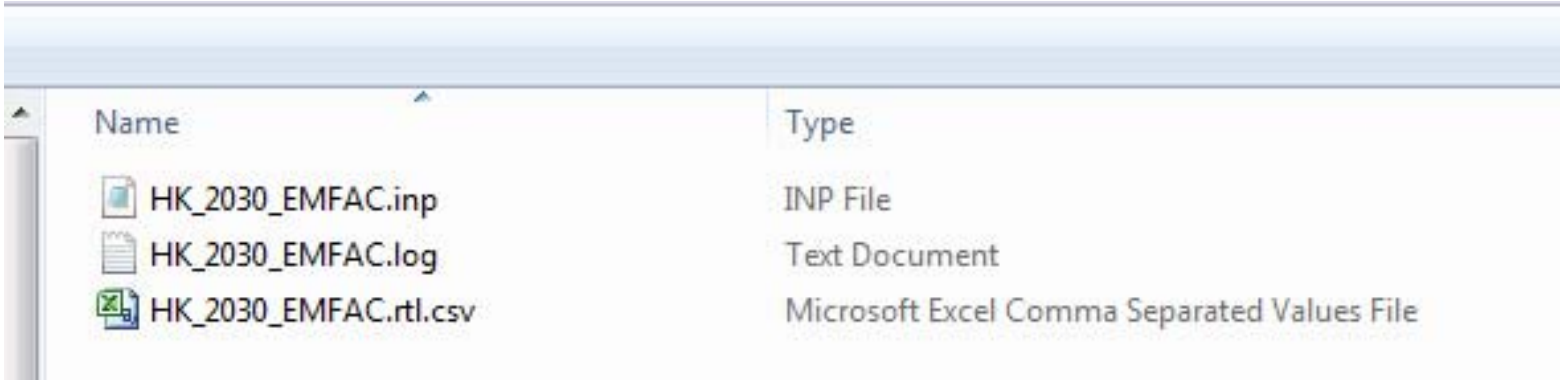
Exercise #2: Select/Edit Speed (default)



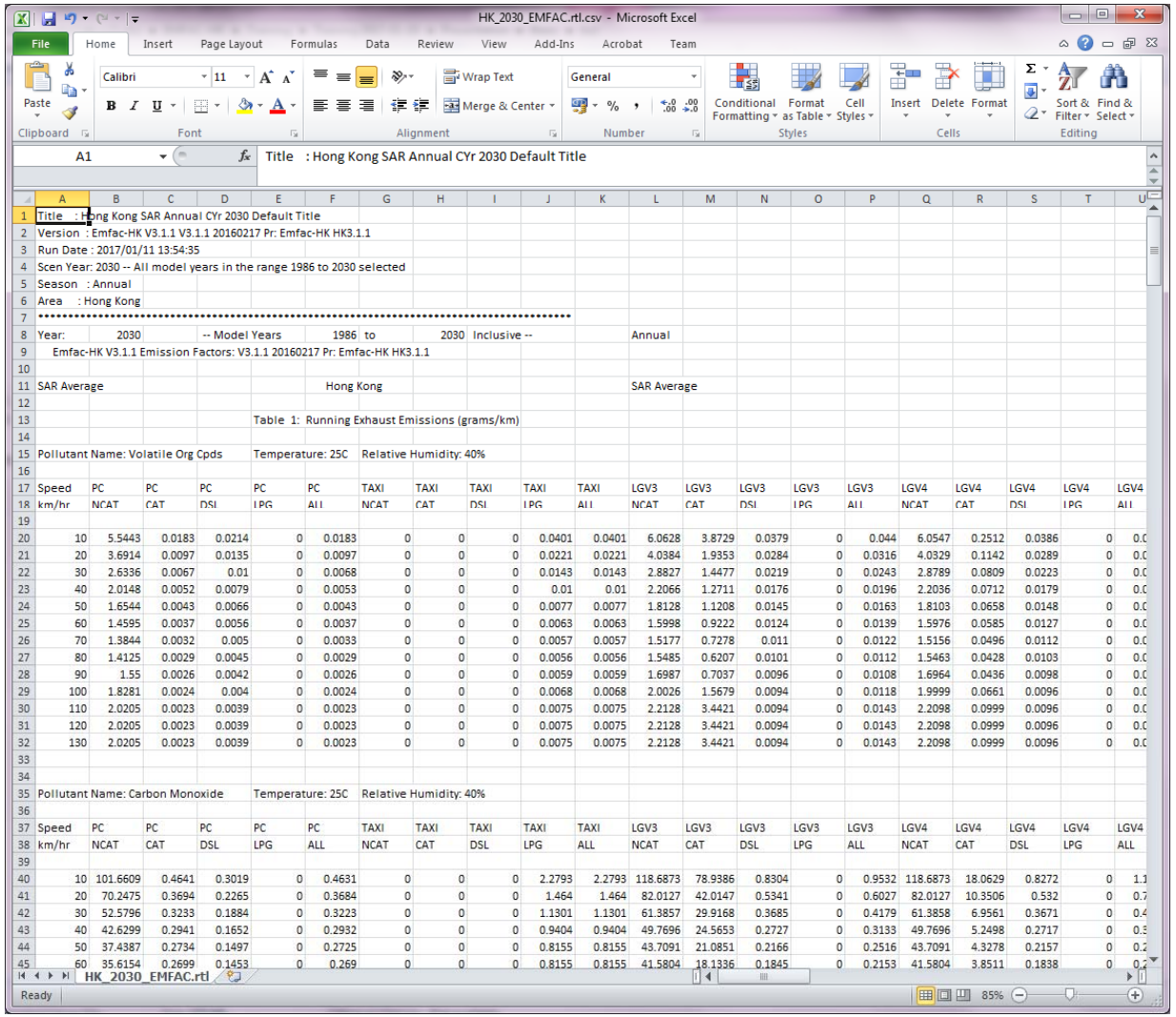


- Save input file as: HK_2030_Emfac.inp and Run

Exercise #2: Output Generated



Exercise #2: HK_2030_EMFAC.rtl.csv



HK_2030_EMFAC.rtl.csv - 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 CYr 2030 Default Title																			
2	Version : Emfac-HK V3.1.1 V3.1.1 20160217 Pr: Emfac-HK HK3.1.1																			
3	Run Date : 2017/01/11 13:54:35																			
4	Scen Year: 2030 -- All model years in the range 1986 to 2030 selected																			
5	Season : Annual																			
6	Area : Hong Kong																			
7	**********																			
8	Year:	2030		-- Model Years		1986	to	2030	Inclusive --			Annual								
9	Emfac-HK V3.1.1 Emission Factors: V3.1.1 20160217 Pr: Emfac-HK HK3.1.1																			
10																				
11	SAR Average					Hong Kong						SAR Average								
12																				
13					Table 1: Running Exhaust Emissions (grams/km)															
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
18	km/hr	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL
19																					
20	10	5.5443	0.0183	0.0214	0	0.0183	0	0	0	0.0401	0.0401	6.0628	3.8729	0.0379	0	0.044	6.0547	0.2512	0.0386	0	0.0
21	20	3.6914	0.0097	0.0135	0	0.0097	0	0	0	0.0221	0.0221	4.0384	1.9353	0.0284	0	0.0316	4.0329	0.1142	0.0289	0	0.0
22	30	2.6336	0.0067	0.01	0	0.0068	0	0	0	0.0143	0.0143	2.8827	1.4477	0.0219	0	0.0243	2.8789	0.0809	0.0223	0	0.0
23	40	2.0148	0.0052	0.0079	0	0.0053	0	0	0	0.01	0.01	2.2066	1.2711	0.0176	0	0.0196	2.2036	0.0712	0.0179	0	0.0
24	50	1.6544	0.0043	0.0066	0	0.0043	0	0	0	0.0077	0.0077	1.8128	1.1208	0.0145	0	0.0163	1.8103	0.0658	0.0148	0	0.0
25	60	1.4595	0.0037	0.0056	0	0.0037	0	0	0	0.0063	0.0063	1.5998	0.9222	0.0124	0	0.0139	1.5976	0.0585	0.0127	0	0.0
26	70	1.3844	0.0032	0.005	0	0.0033	0	0	0	0.0057	0.0057	1.5177	0.7278	0.011	0	0.0122	1.5156	0.0496	0.0112	0	0.0
27	80	1.4125	0.0029	0.0045	0	0.0029	0	0	0	0.0056	0.0056	1.5485	0.6207	0.0101	0	0.0112	1.5463	0.0428	0.0103	0	0.0
28	90	1.55	0.0026	0.0042	0	0.0026	0	0	0	0.0059	0.0059	1.6987	0.7037	0.0096	0	0.0108	1.6964	0.0436	0.0098	0	0.0
29	100	1.8281	0.0024	0.004	0	0.0024	0	0	0	0.0068	0.0068	2.0026	1.5679	0.0094	0	0.0118	1.9999	0.0661	0.0096	0	0.0
30	110	2.0205	0.0023	0.0039	0	0.0023	0	0	0	0.0075	0.0075	2.2128	3.4421	0.0094	0	0.0143	2.2098	0.0999	0.0096	0	0.0
31	120	2.0205	0.0023	0.0039	0	0.0023	0	0	0	0.0075	0.0075	2.2128	3.4421	0.0094	0	0.0143	2.2098	0.0999	0.0096	0	0.0
32	130	2.0205	0.0023	0.0039	0	0.0023	0	0	0	0.0075	0.0075	2.2128	3.4421	0.0094	0	0.0143	2.2098	0.0999	0.0096	0	0.0
33																					
34																					
35	Pollutant Name: Carbon Monoxide				Temperature: 25C		Relative Humidity: 40%													
36																					
37	Speed	PC	PC	PC	PC	PC	TAXI	TAXI	TAXI	TAXI	TAXI	LGV3	LGV3	LGV3	LGV3	LGV3	LGV4	LGV4	LGV4	LGV4	LGV4
38	km/hr	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL
39																					
40	10	101.6609	0.4641	0.3019	0	0.4631	0	0	0	2.2793	2.2793	118.6873	78.9386	0.8304	0	0.9532	118.6873	18.0629	0.8272	0	1.1
41	20	70.2475	0.3694	0.2265	0	0.3684	0	0	0	1.464	1.464	82.0127	42.0147	0.5341	0	0.6027	82.0127	10.3506	0.532	0	0.7
42	30	52.5796	0.3233	0.1884	0	0.3223	0	0	0	1.1301	1.1301	61.3857	29.9168	0.3685	0	0.4179	61.3858	6.9561	0.3671	0	0.4
43	40	42.6299	0.2941	0.1652	0	0.2932	0	0	0	0.9404	0.9404	49.7696	24.5653	0.2727	0	0.3133	49.7696	5.2498	0.2717	0	0.3
44	50	37.4387	0.2734	0.1497	0	0.2725	0	0	0	0.8155	0.8155	43.7091	21.0851	0.2166	0	0.2516	43.7091	4.3278	0.2157	0	0.2
45	60	35.6154	0.2699	0.1453	0	0.269	0	0	0	0.8155	0.8155	41.5804	18.1336	0.1845	0	0.2153	41.5804	3.8511	0.1838	0	0.2

HK_2030_EMFAC.rtl

Ready

85%

Exercise #3: Changing Technology Group Fractions

- This exercise evaluates emission changes in 2030 if the Gov't introduces a tax incentive program by implementing Euro V in 2010 for Light Goods Vehicles ≥ 3.5 tonnes (i.e. LGV6).

- Hints:
  - Add 40% Euro V from model year 2010 to 2012 for LGV6

Exercise #3: Changing TG Fractions

- Base Case (similar to Ex1):
  - Calendar Years: 2030
  - Scenario Type: BURDEN
  - Output File types: MVEI7G (BCD)
  - Pollutants: PM10, VOC

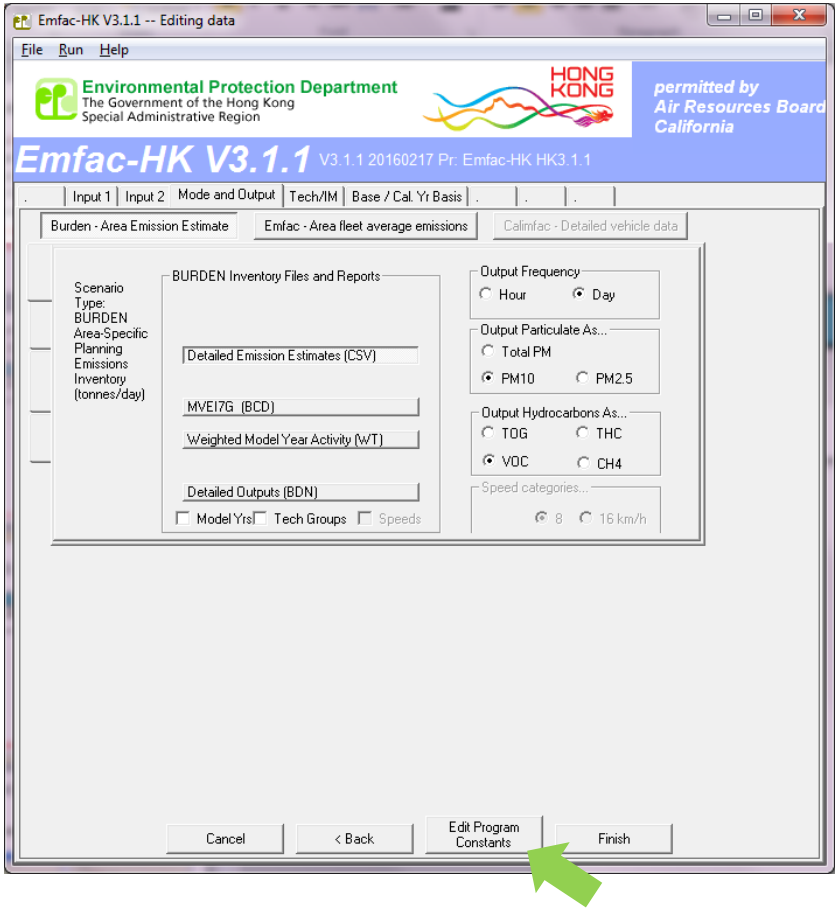
- Create a new case with same scenario data and edit TG fraction on LGV6

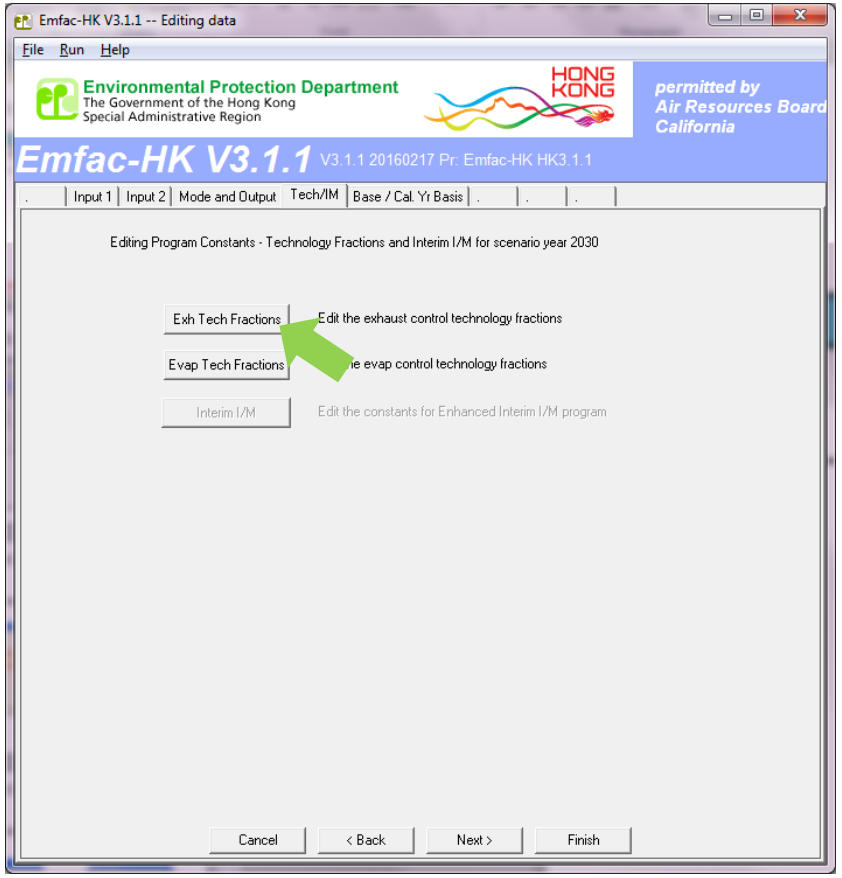
Exercise #3: Update TG fraction on LGV6

Case	Model Year	TG 119 Euro IV – POC	TG 132 Euro IV – DPF	TG 133 Euro V - DPF	Total Fraction
Base	2010	17.435%	82.5646%	-	100%
New	2010-2012	17.435%	42.5646%	40%	100%

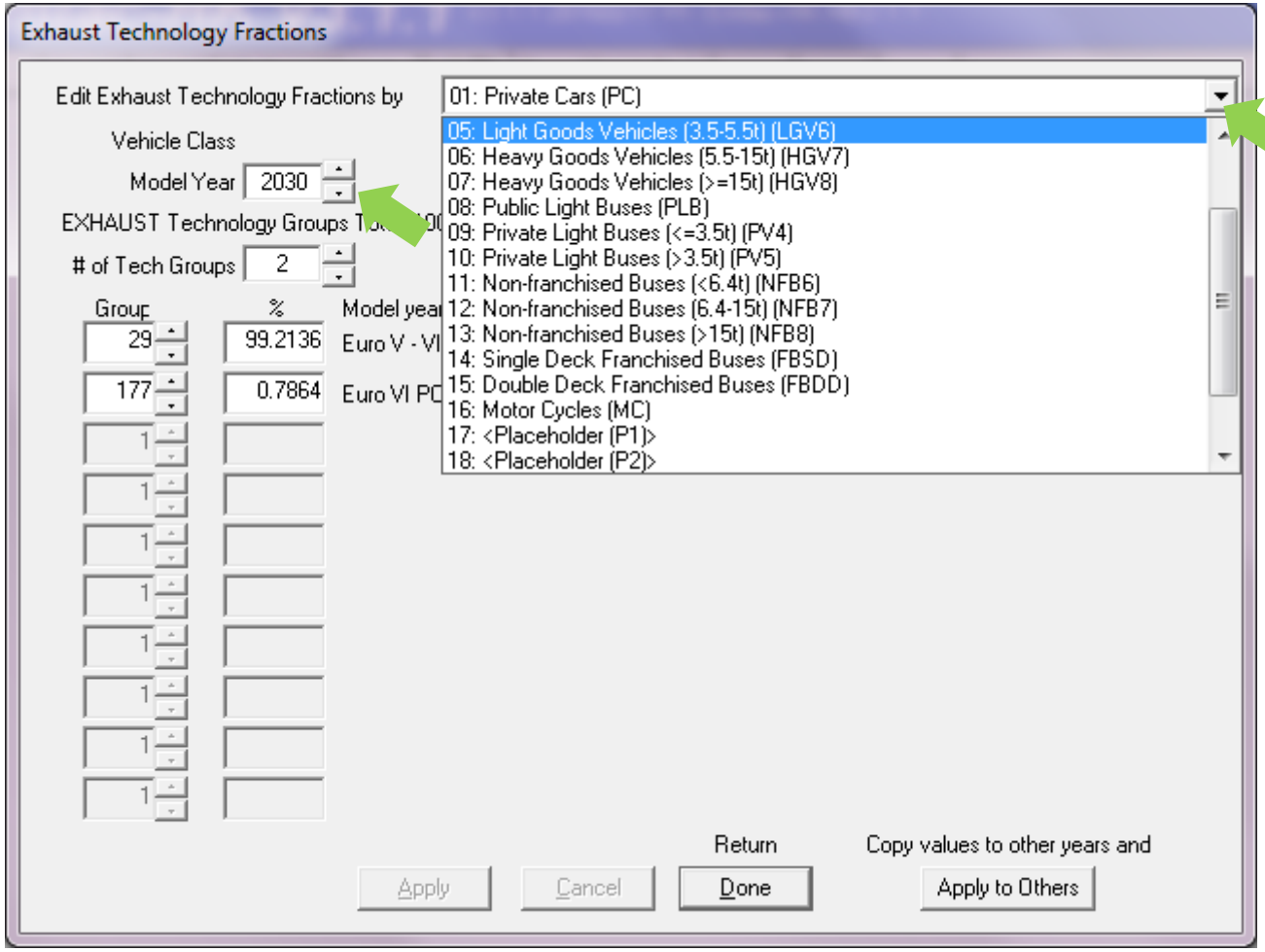
- Move 40% from TG132 to TG 133 at 2010
- Apply same fraction to 2011 & 2012

Exercise #3: Update TG fraction on LGV6



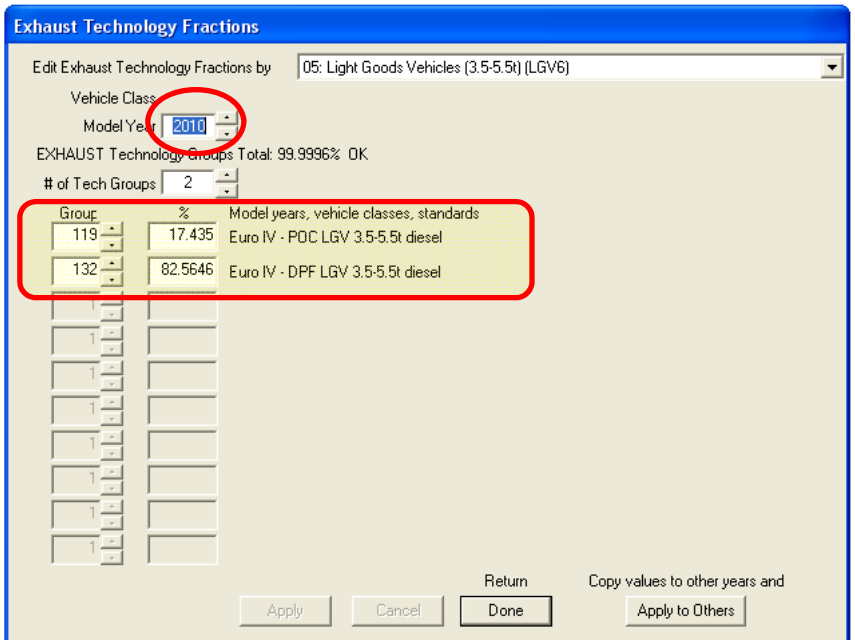


Exercise #3: Update TG fraction on LGV6

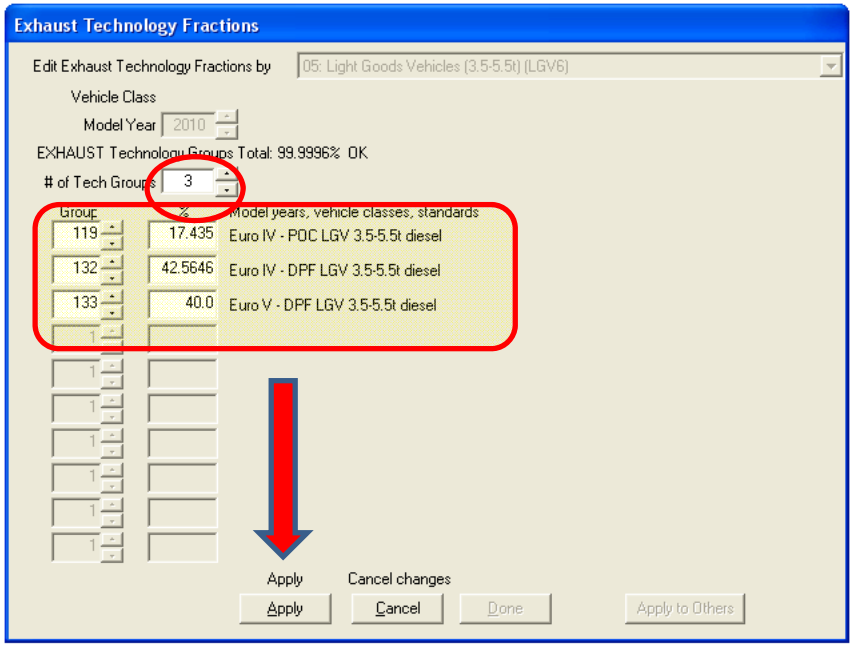


Exercise #3: Exhaust TG Modification Tab

Before Edit



After Edit

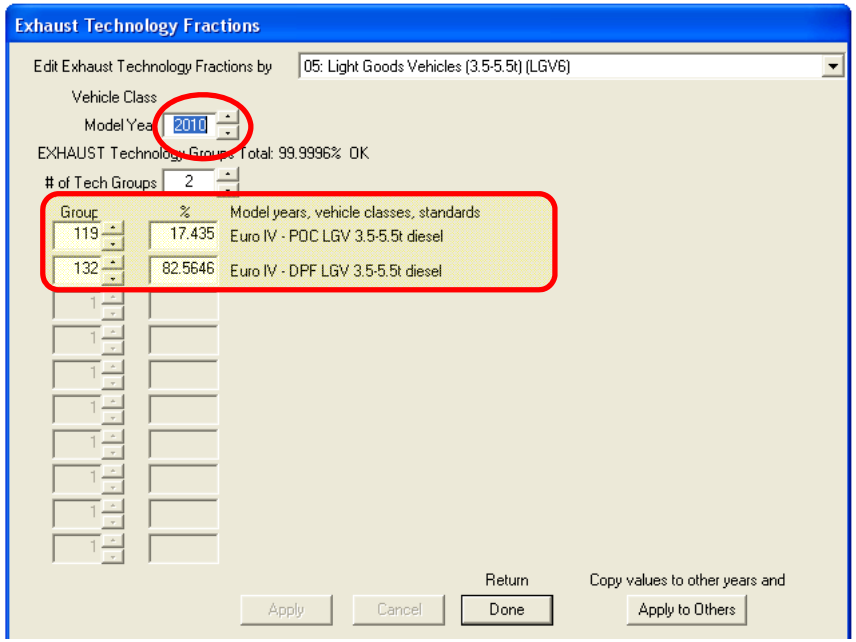


"**Apply**" before changing model year or veh class or pressing "**Done**"

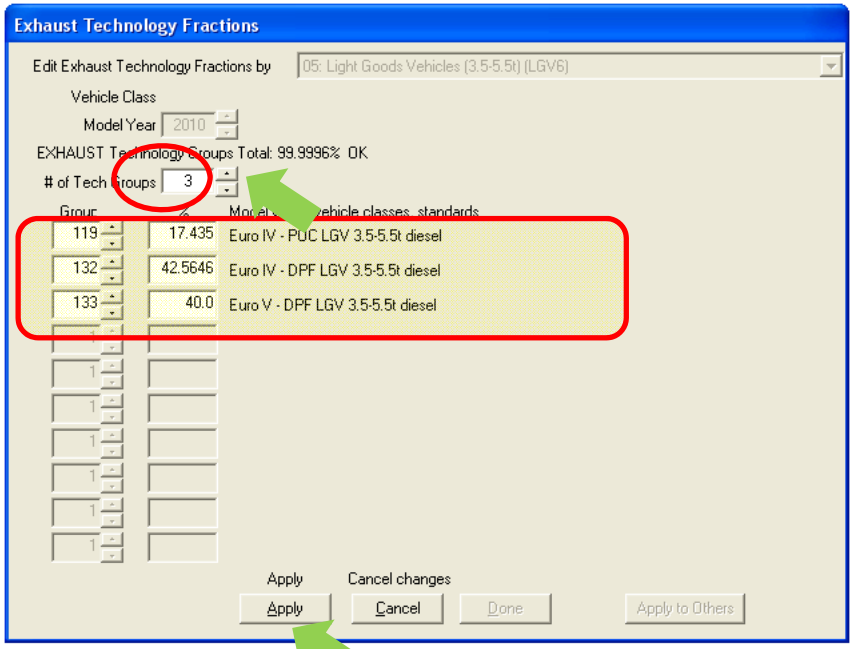
Exercise #3:

Model Year	TG 119 Euro IV – POC	TG 132 Euro IV – DPF	TG 133 Euro V - DPF	Total Fraction
2010-2012	17.435%	42.5646%	40%	100%

Before Edit

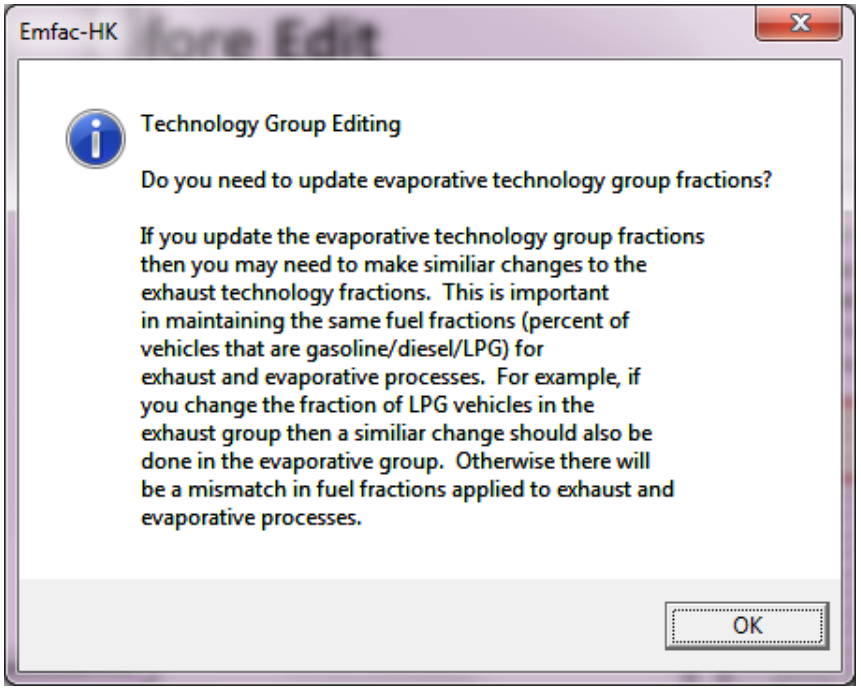


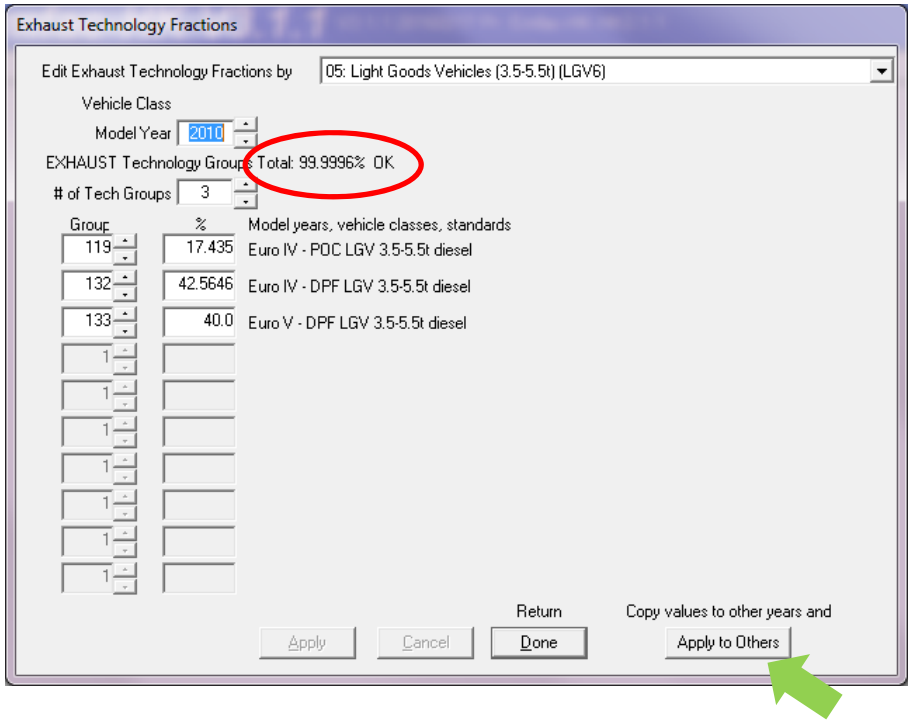
After Edit



Click "**Apply**"

Exercise #3:

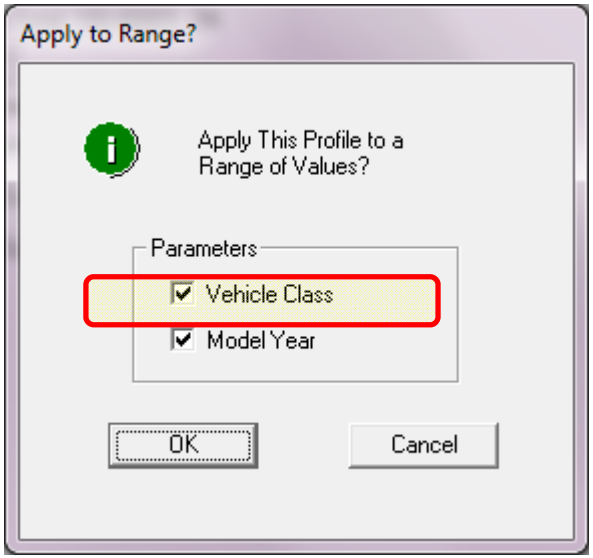




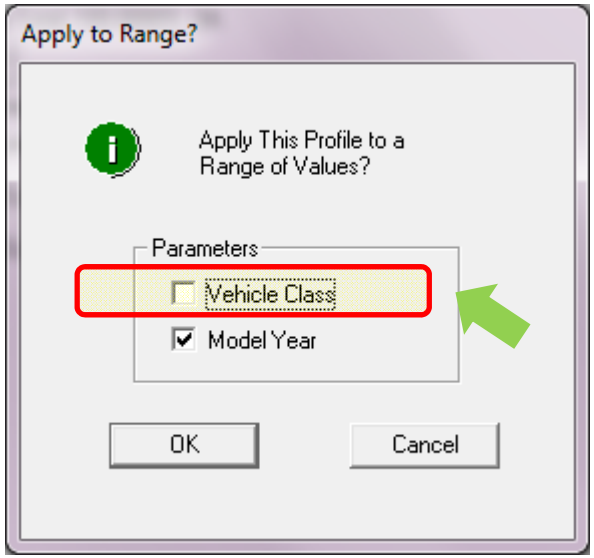
Click "**Apply to Others**"

Exercise #3:

Before Edit



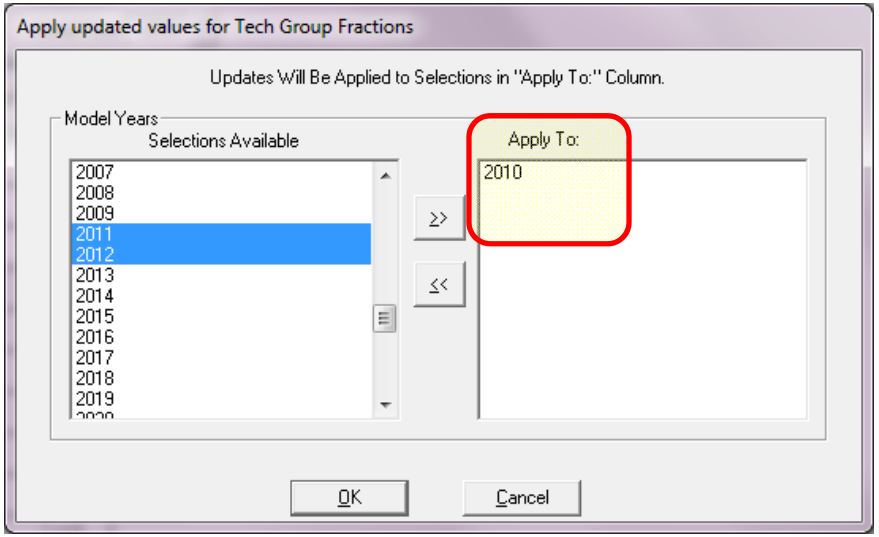
After Edit



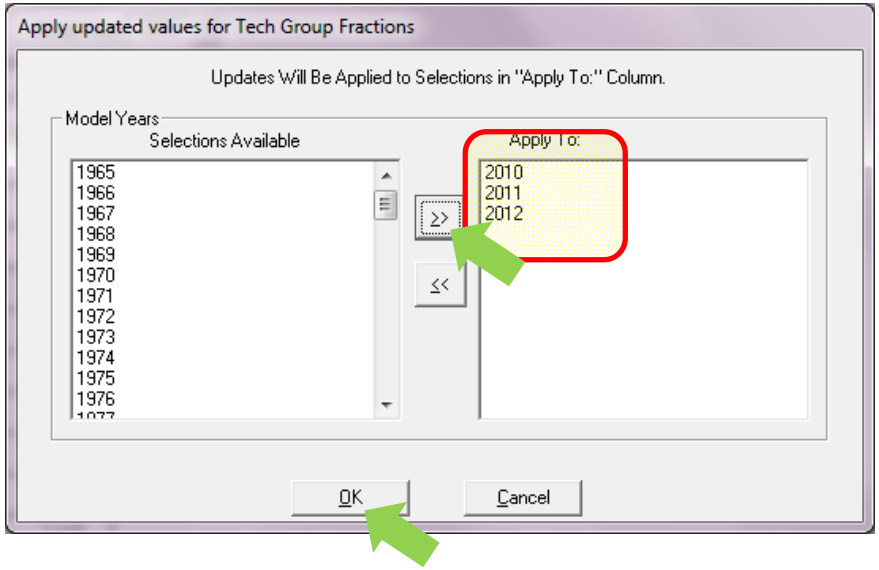
- "Apply to Others – Model Year Only"

Exercise #3:

Before Edit

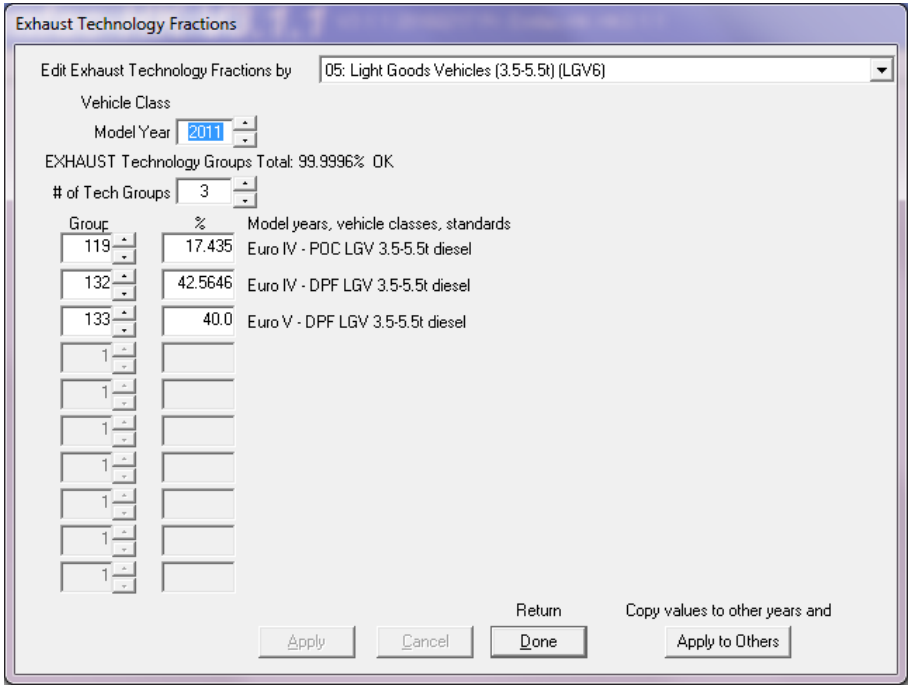


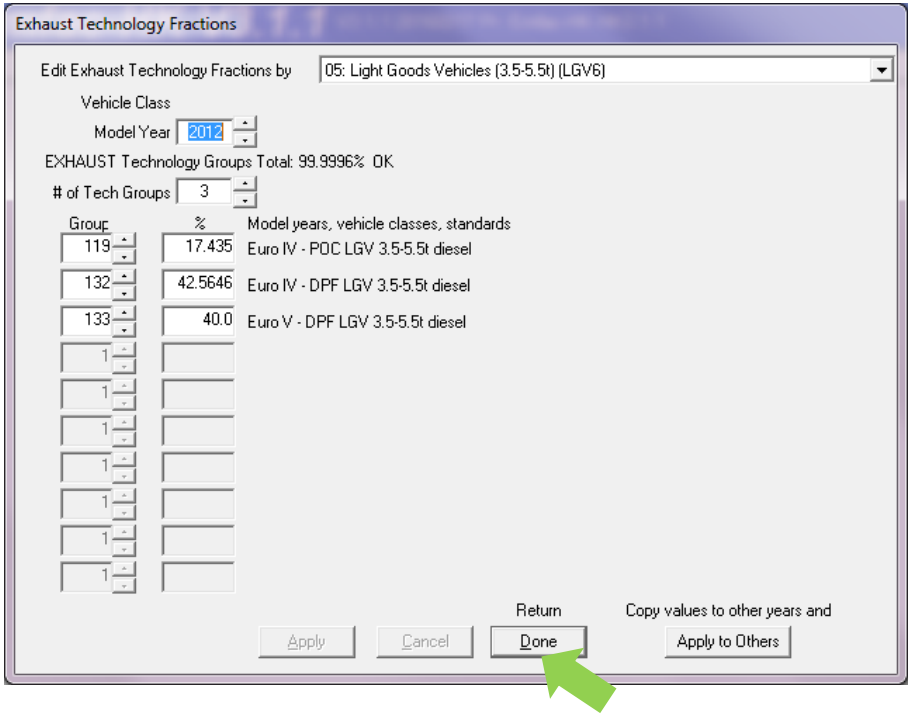
After Edit



- 2010 TG fraction same as 2011 & 2012

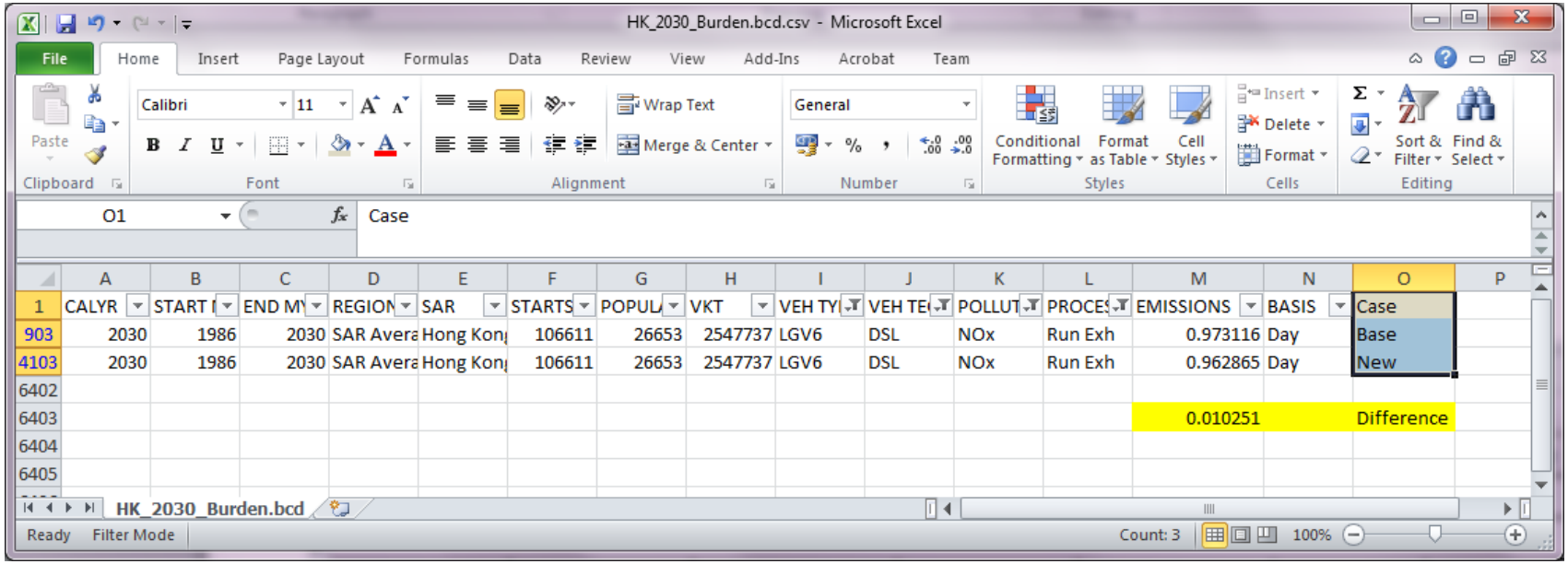
Exercise #3:





- Save input file as: HK_2030_LGV6.inp and Run

Exercise #3: Solution



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	CALYR	START I	END MY	REGION	SAR	STARTS	POPULA	VKT	VEH TY	VEH TE	POLLUT	PROCES	EMISSIONS	BASIS	Case	
903	2030	1986	2030	SAR Avera	Hong Kon	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.973116	Day	Base	
4103	2030	1986	2030	SAR Avera	Hong Kon	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.962865	Day	New	
6402																
6403													0.010251		Difference	
6404																
6405																

Exercise #4: Changing Vehicle Kilometer Travelled (VKT)

- This exercise estimates emissions for an area with known VKT of specific vehicle class.

- Two approaches to change VKT:
  1) adjust the population to match desired VKT (conformity adjustment: model will alter VKT and Trips)
  2) directly alter the VKT

Exercise #4: Changing VKT

- At year 2030, petrol private cars (Vehicle Class 1) has *forecasted* VKT of 1,609,000 km/day.

- This Exercise will be conducted in three phases:
  - 4 : base case
  - 4a: conformity adjustment
  - 4b: direct VKT adjustment

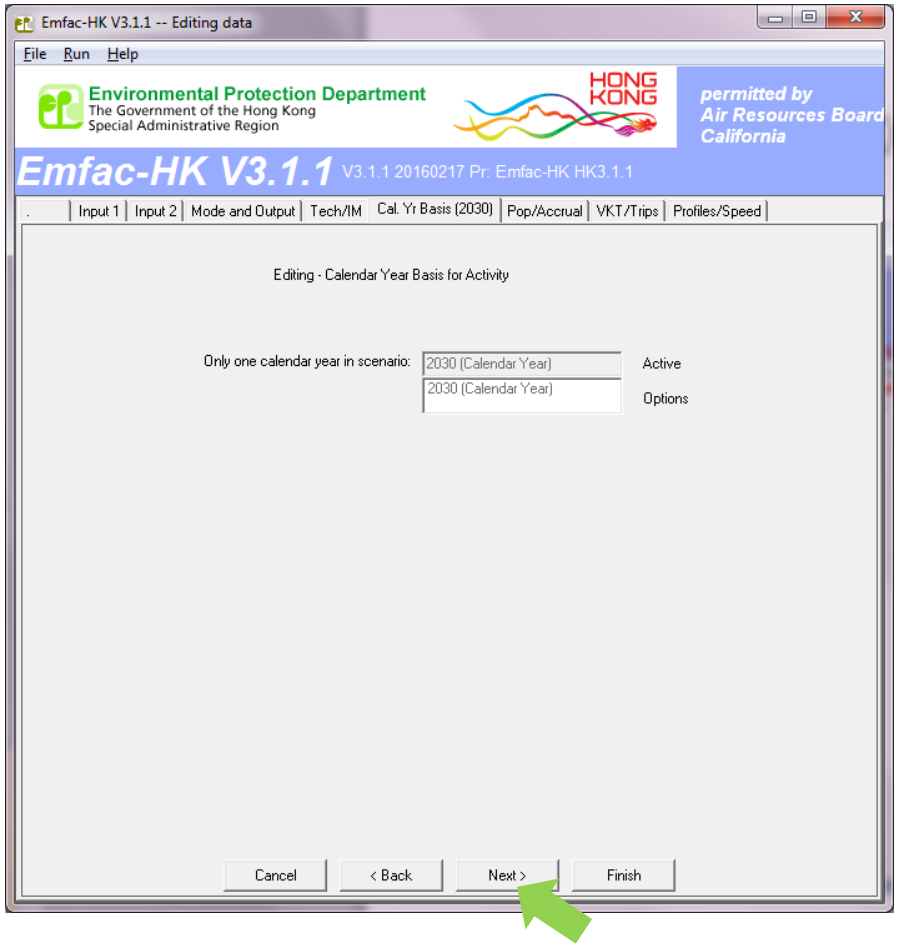
Exercise # 4: Base Case

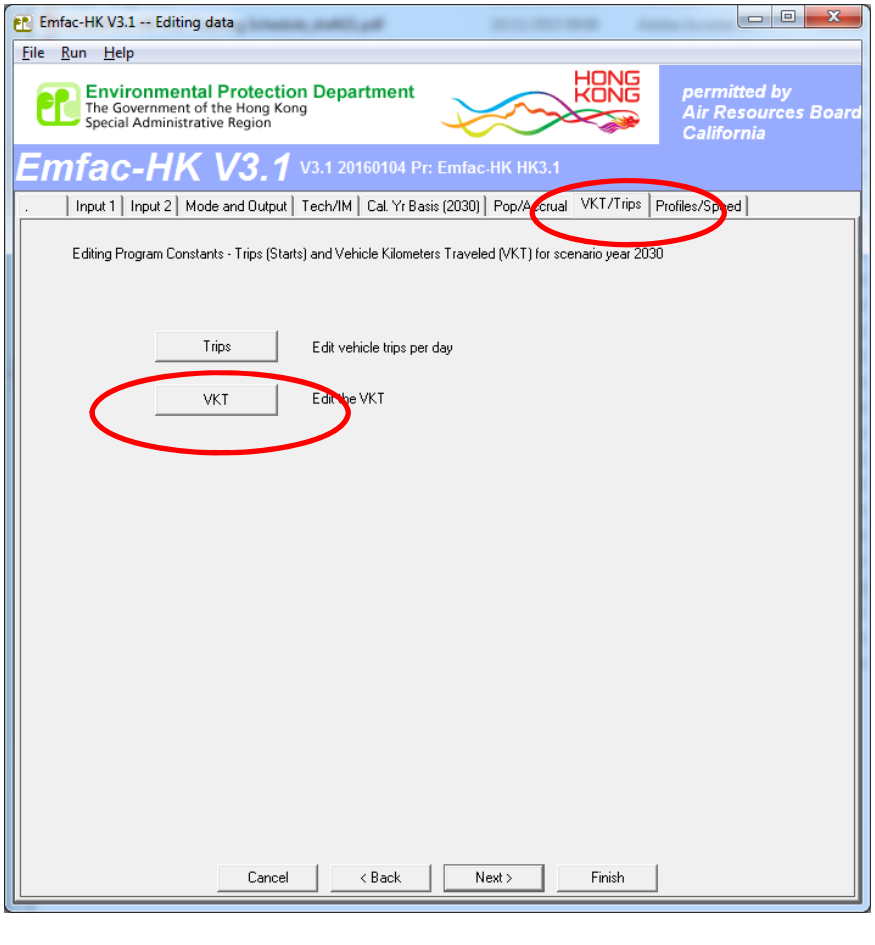
- Scenario data:
  - Calendar Years: 2030
  - Scenario Type: BURDEN
  - Output File types: Detailed Estimates (CSV)
  - Output Frequency: Day
  - Pollutants: PM10, VOC

Exercise # 4a: Conformity Adjustment

- Create a new case with same scenario data as base case
- Determine VKT adjustment factor
- Multiply population by above factor

Exercise # 4a:

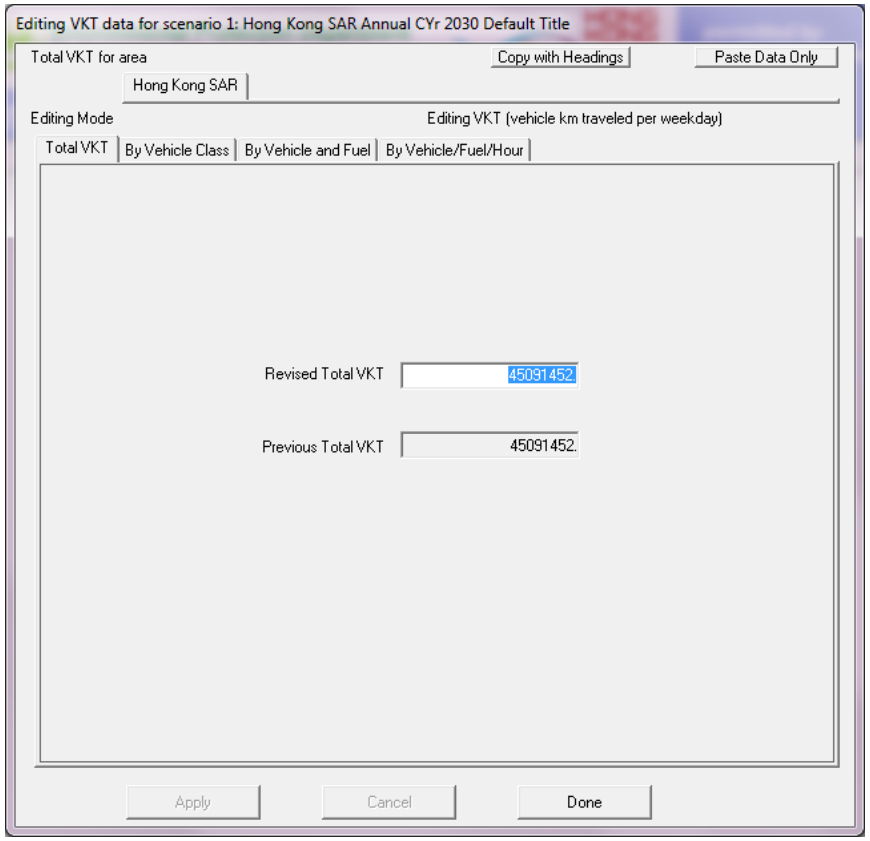




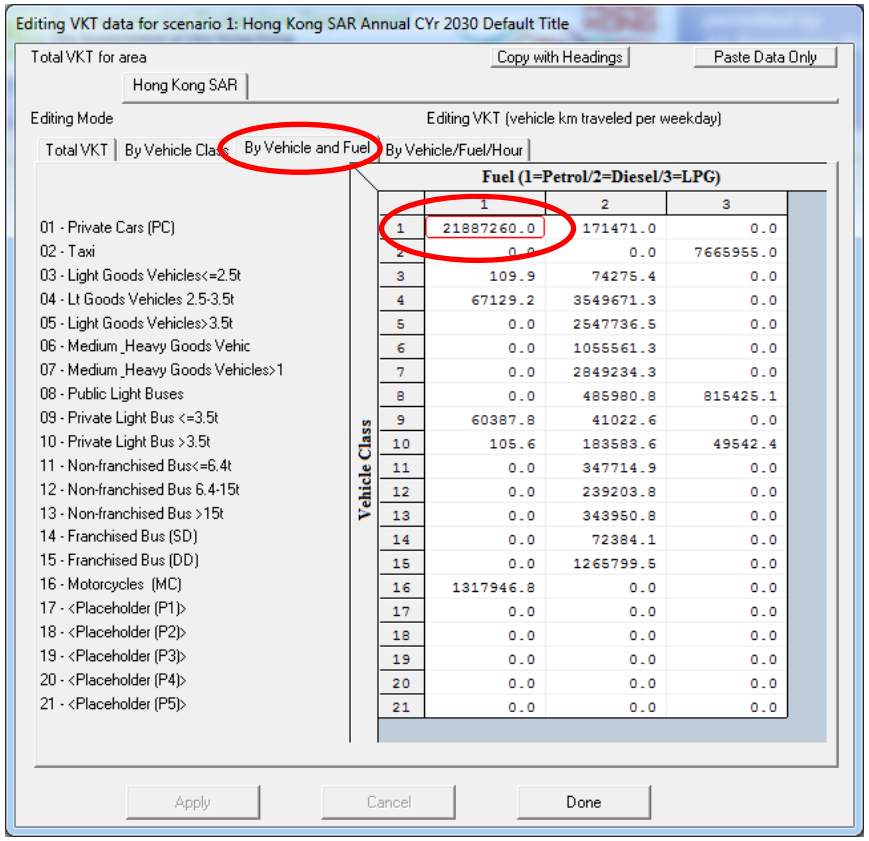
- Click Next until VKT/Trips tab

Exercise # 4a:

Total VKT tab



By Vehicle and Fuel tab

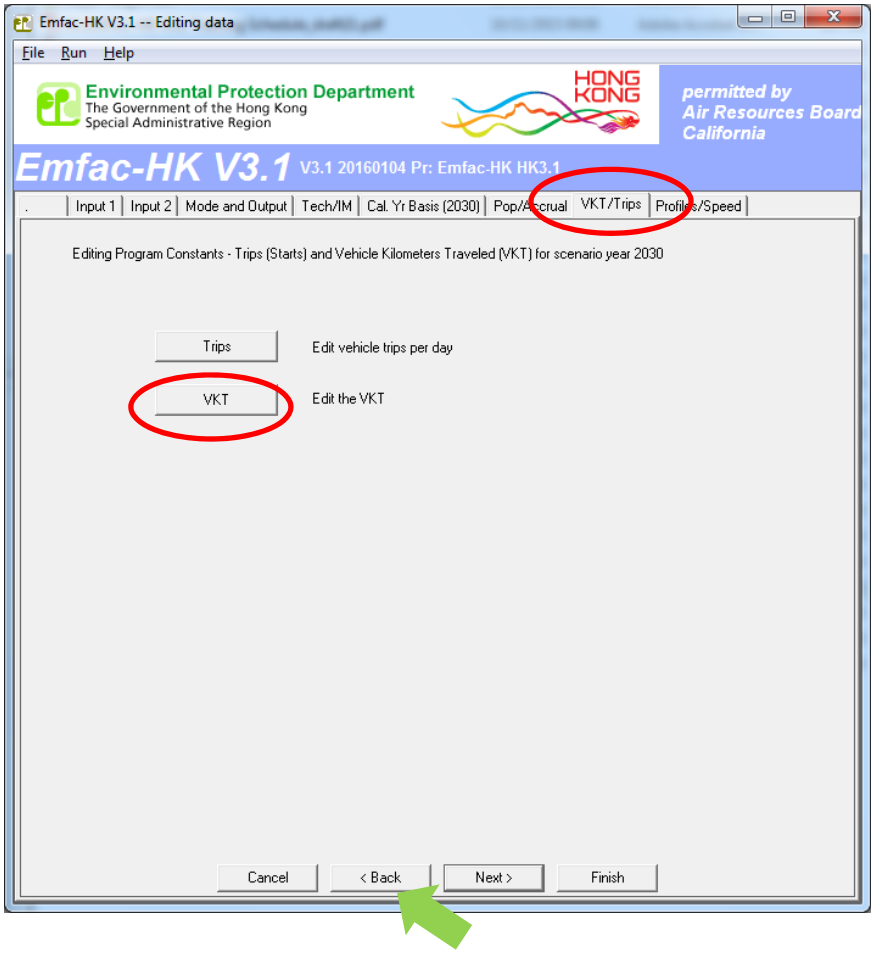


- VKT adjustment factor is :

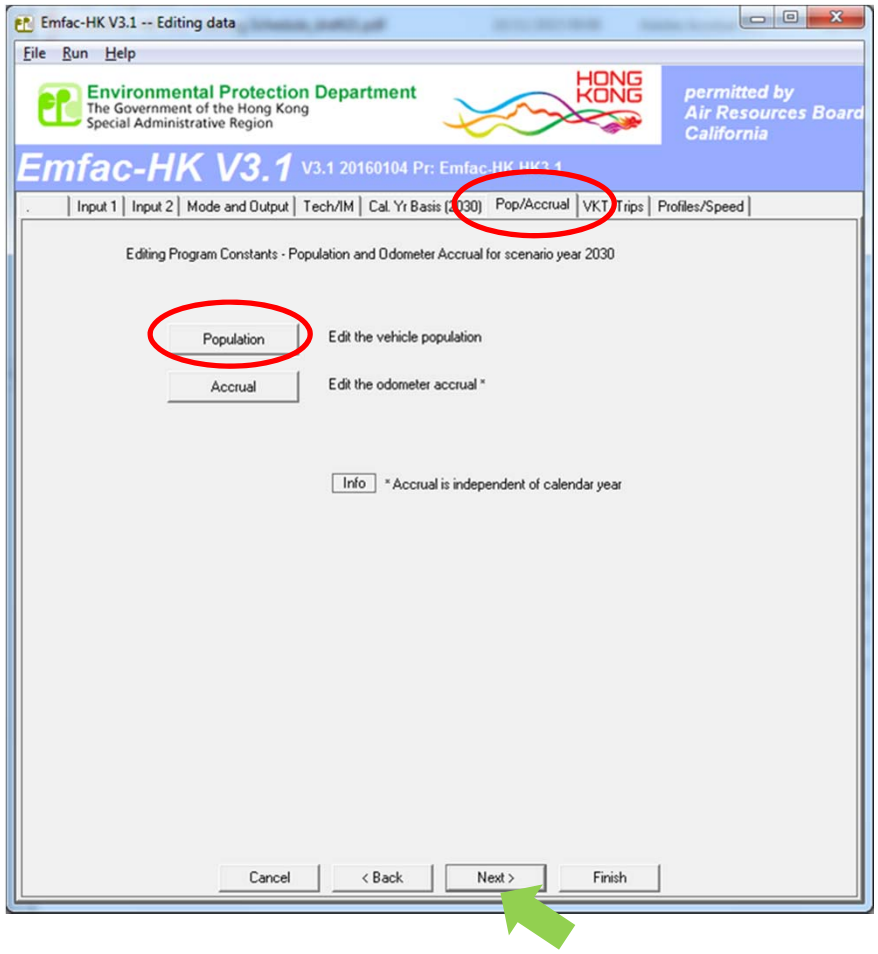
1,609,000 ÷ 21,887,260 = 0.0735

Exercise # 4a:

VKT/Trips tab



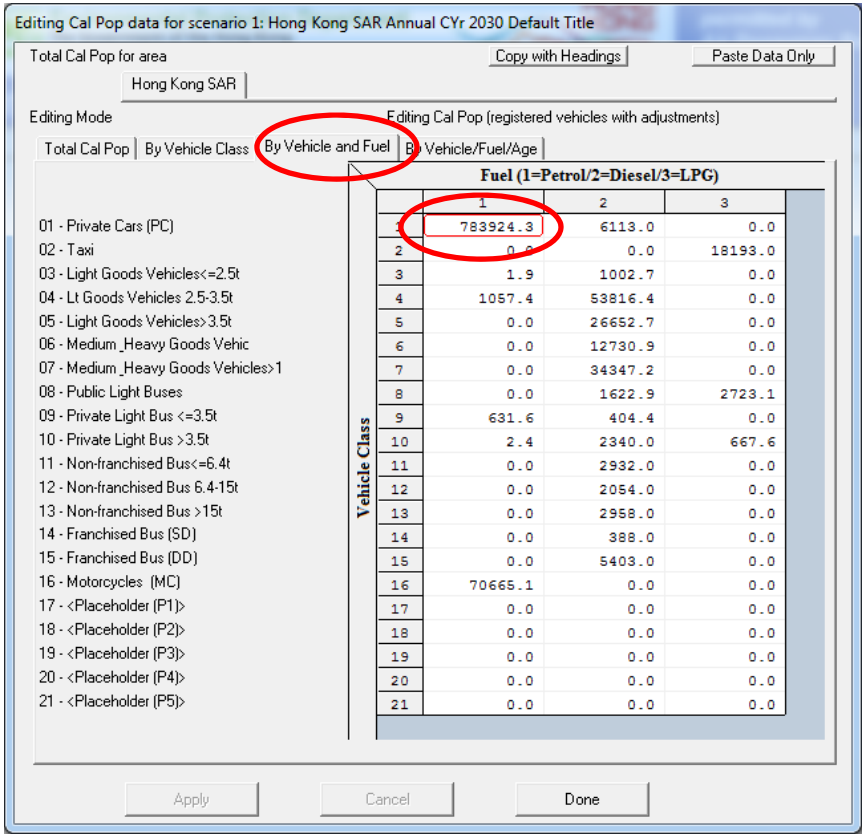
Pop/Accural tab



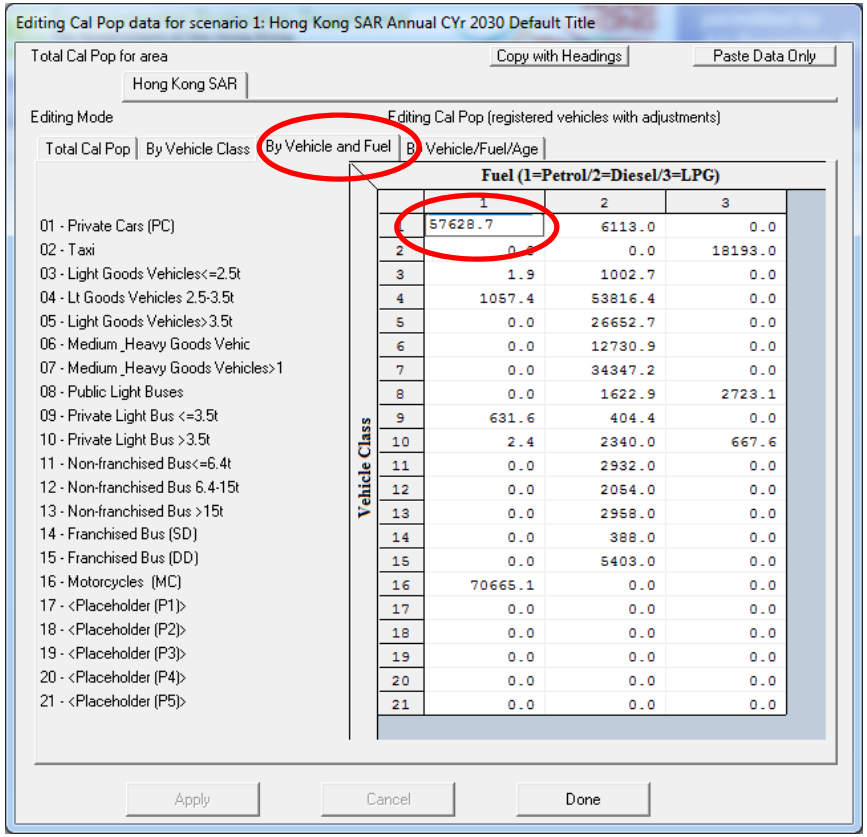
- Back to Population → By Vehicle and Fuel tab

Exercise # 4a:

2030 Population (Base Case)



2030 Population (Edited for VKT Match)

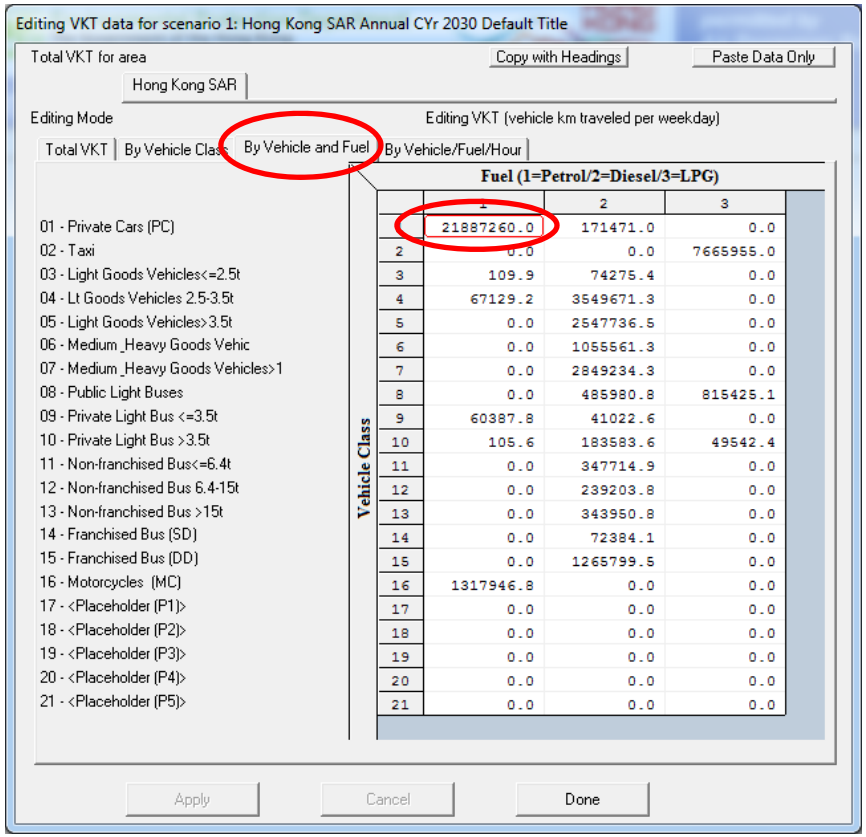


- Multiply population by factor:

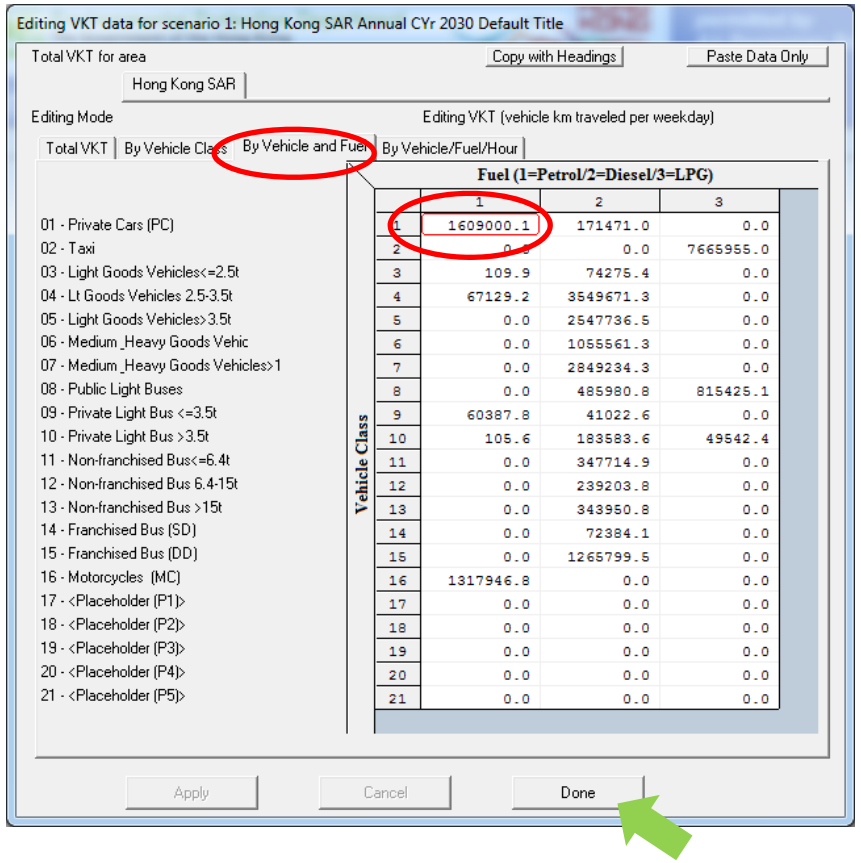
783,924 * 0.0735 = 57,629

Exercise # 4a: Verify VKT Adjustment

2030 VKT
(Base Case)



2030 VKT
(After Pop Edit)



- Save input file as

HK_2030_Burden_by_Hour_edit VKT (conformity).inp and Run

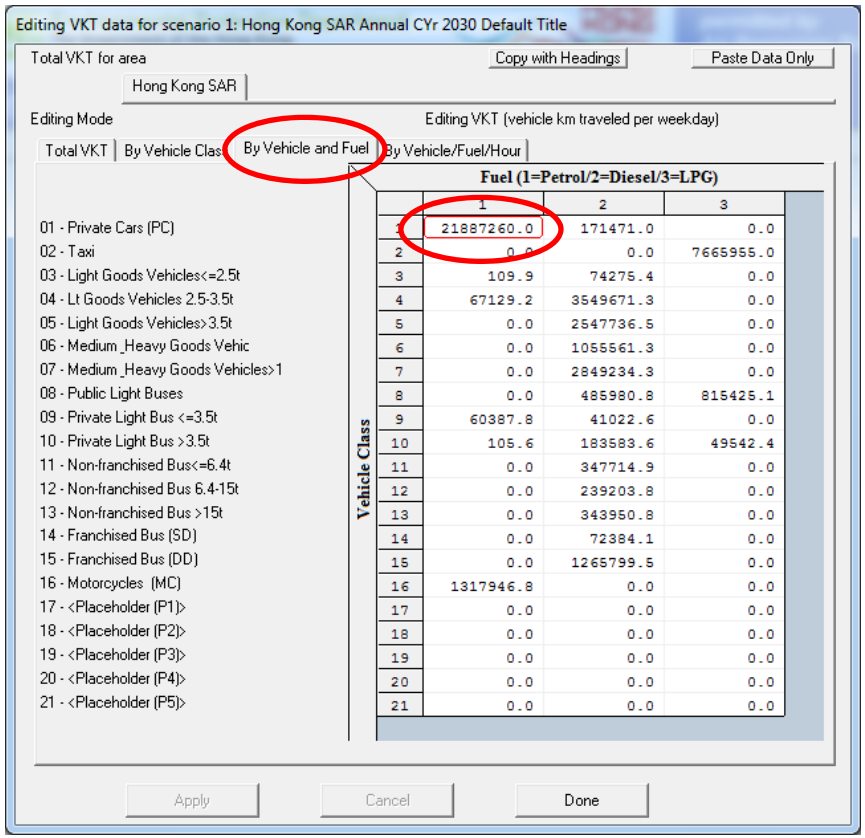
Exercise # 4b: Direct VKT adjustment

- Create a new case with same scenario data as base case

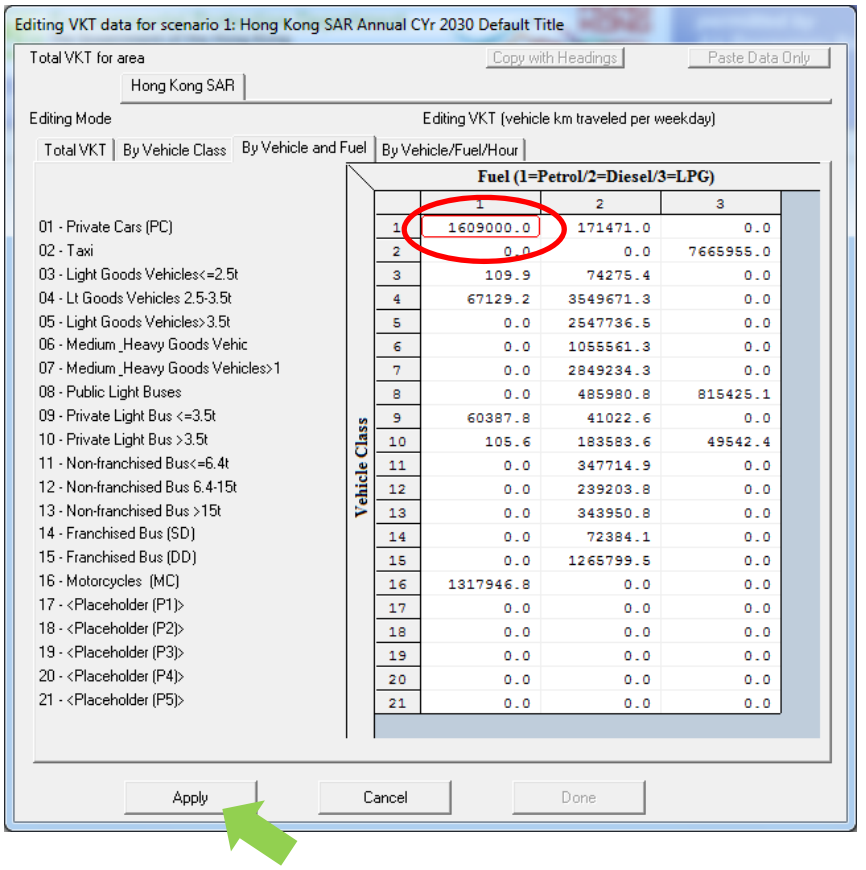
- Direct entry of new VKT for petrol private cars as 1,609,000 km/day

Exercise # 4b: Editing VKT Screen

2030 VKT
(Base Case)



2030 VKT
(After VKT Edit)



- Save input file as

HK_2030_Burden_by_Hour_edit VKT (directly).inp and Run

Exercise # 4: Solution

PC-NCAT & PC-CAT	Base	#4a: Pop-adjusted VKT	#4b: VKT direct
Vehicles	783,924	**57,628**	783,924
VKT	21,887,261	1,609,000	1,609,000
Trips	1,176,004	**86,451**	1,176,004
NOx Run Exhaust (tonne/day)	0.2224	0.0163	0.0163
NOx Start Exhaust (tonne/day)	0.0402	**0.0030**	0.0402

Notes:
Results show how the model adjusted trips in Exercise #4a, thus, starting exhaust as well. Running exhaust emissions do not differ.
Exercise #4b shows it is possible to directly input VKT into EMFAC-HK; however, it is generally not recommended to do this independent of vehicle population because of the desire to properly estimate start and evaporative emissions tied to the size of the vehicle fleet.

Exercise #5: Changing Trips

- This exercise estimates the emission reduction when reduces trips for petrol Private Cars in 2015 to 250,000 trips per day.

- There are two potential methods:

  1) Ex 5a: Adjust the population to match desired Trips (i.e., “conformity” approach)

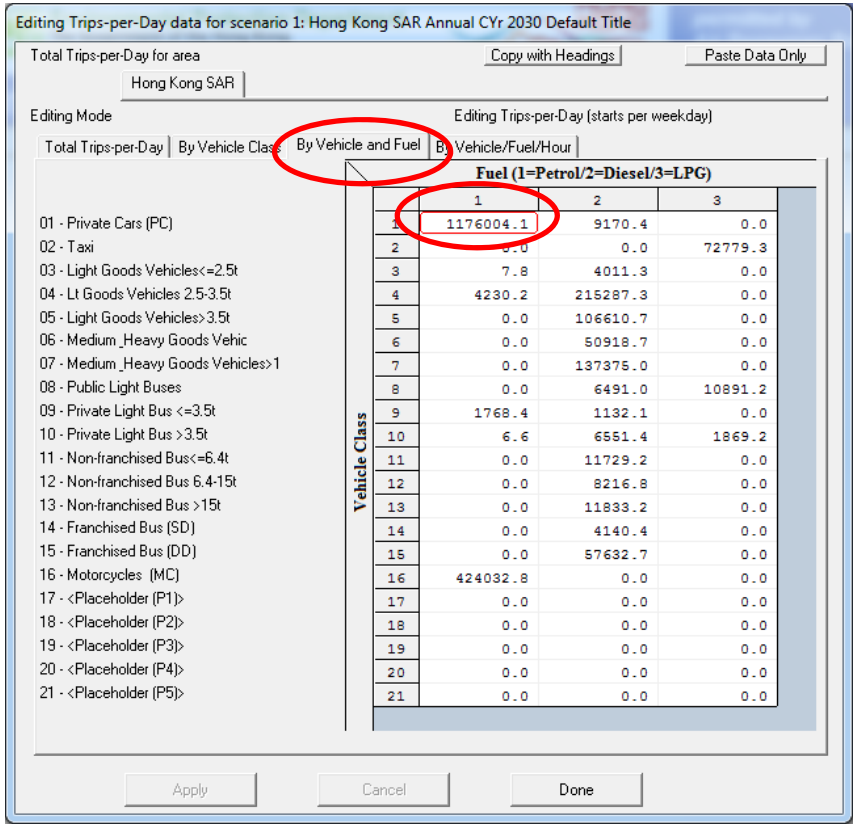
  2) Ex 5b: Directly alter the Trips

Exercise # 5a: Conformity Adjustment

- Base Case (2030, Burden, CSV outputs)
- New case with same scenario data as base case
- Determine Trips adjustment factor
- Multiply population by above factor

Exercise # 5a: Trips adjustment factor

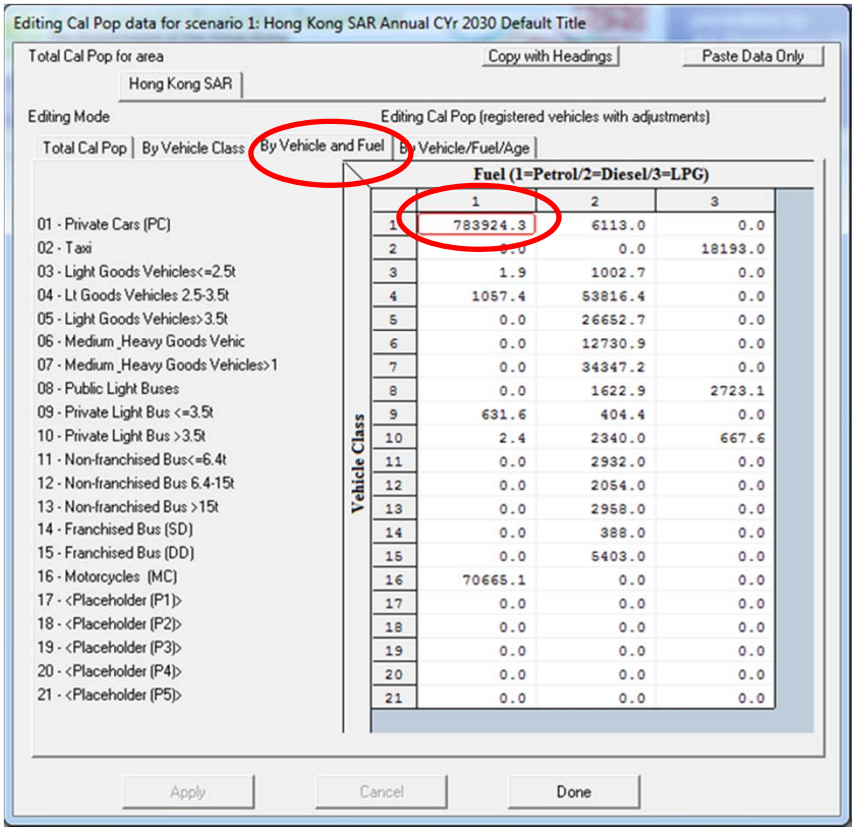
2030 Trips by Vehicle and Fuel of petrol PC



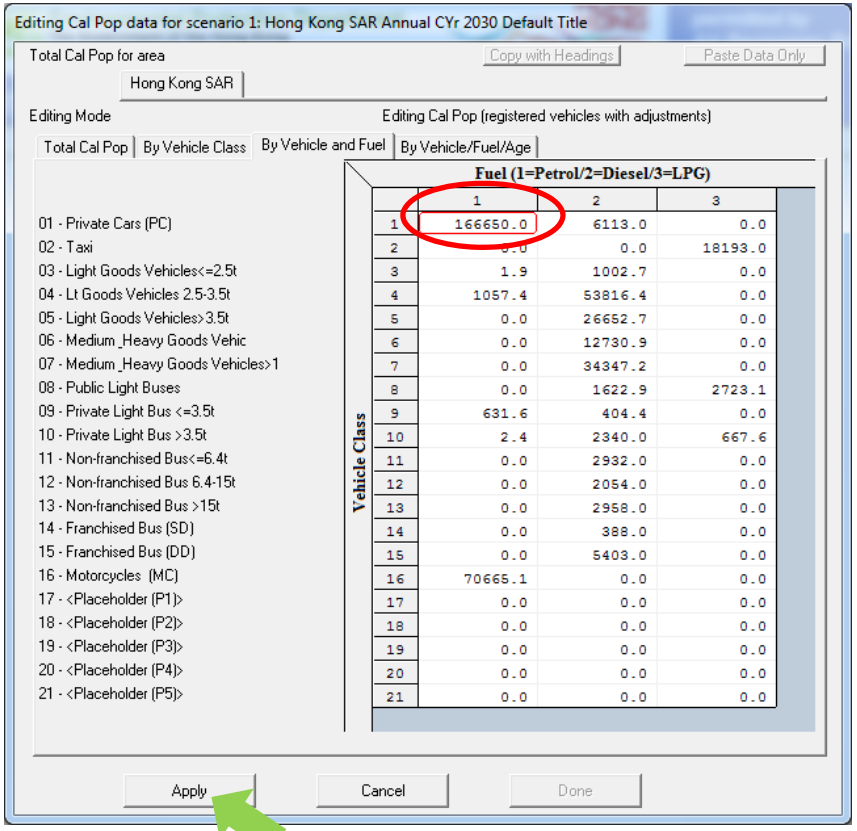
Factor = 250,000 ÷ 1,176,004 = 0.2126

Exercise # 5a: Population Edits

2030 Population (Base Case)



2030 Population (Edited for Trips Match)

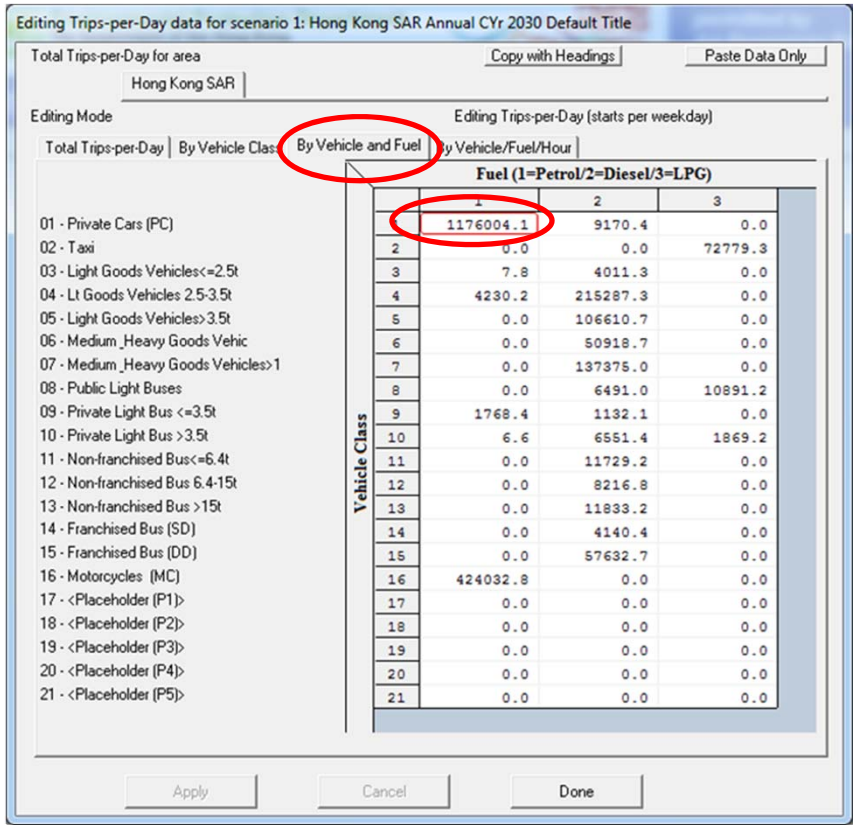


Multiply population by factor:

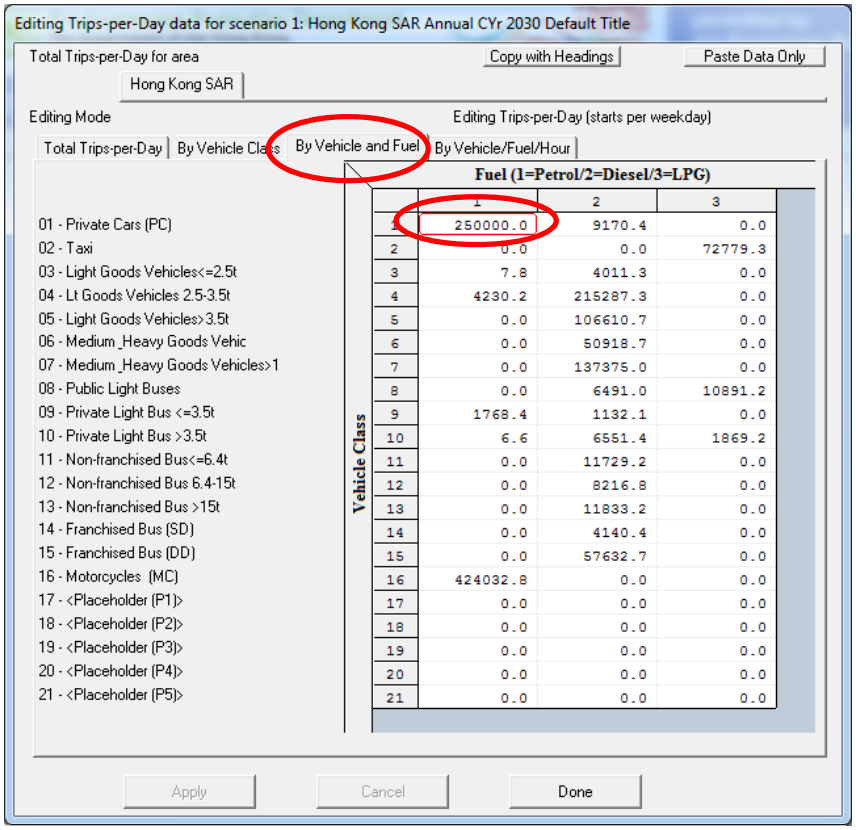
783,924 * 0.2126 = 166,650 vehicles

Exercise # 5a: Verify Trips Adjustment

2030 Trips
(Base Case)



2030 Trips
(After Pop Edit)



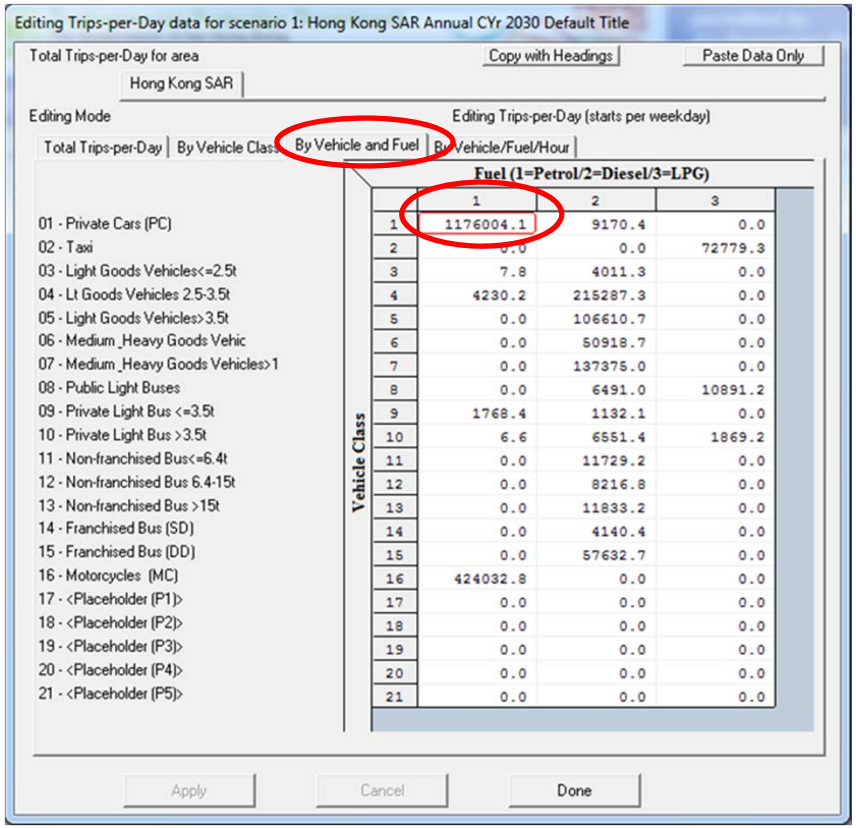
- Save input file as

HK_2030_Burden_edit VKT (conformity).inp and Run

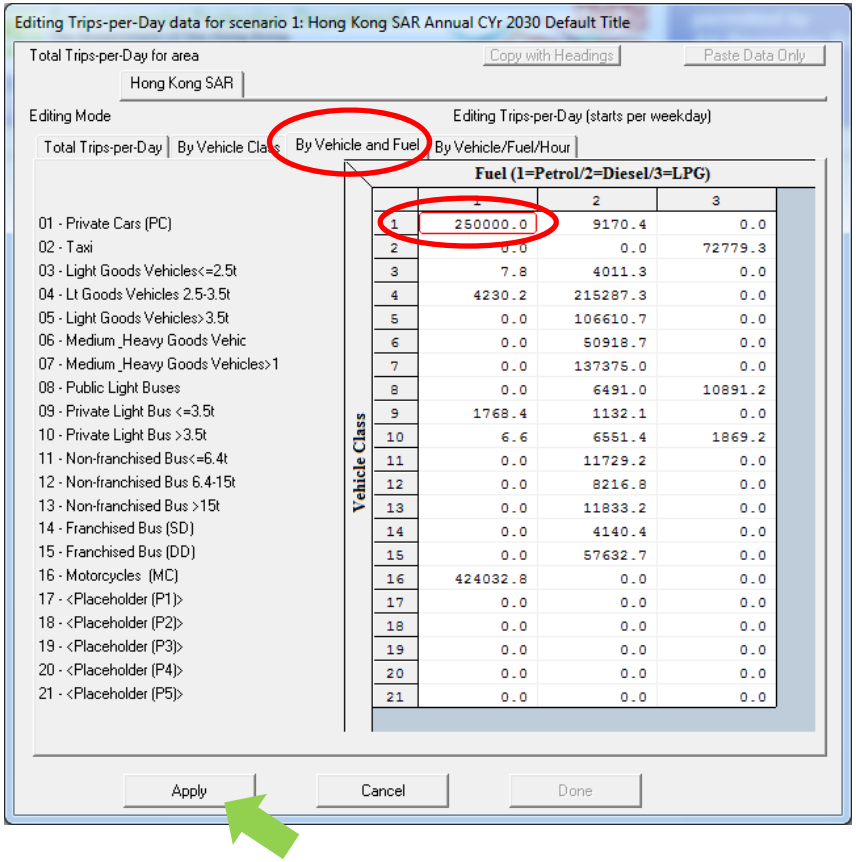
Exercise # 5b: Changing Trips (Directly)

- Create new case with scenario data same as base case

2030 Trips
(Base Case)



2030 Trips
(After Trips Edit)



- Save input file as

HK_2030_Burden_edit VKT (directly).inp and Run

Exercise # 5c: Solution

PC-NCAT & PC-CAT	Base	#5a: Pop-adjusted Trips	#5b: Trips direct
Vehicles	783,924	**166,650**	783,924
VKT	21,887,261	**4,652,888**	21,887,261
Trips	1,176,004	250,000	250,000
NOx Run Exhaust	0.2224	**0.0473**	0.2224
NOx Start Exhaust	0.0402	**0.0085**	0.0085

Notes:

Results show how altering trips via population (#5a) also alters VKT; thus, running exhaust is altered, as well.

Exercise #5b shows altering trips only reduces starting exhaust.

Exercise #6: Speed Distributions

- This exercise estimates NOx running exhaust emissions change when average speed of specific vehicle class at different time zone is altered.

- A new policy propose medium and heavy goods vehicles (HGV7 & HGV8) only travel at specific time zone and speed profile.

- 2 periods:
  - from midnight to 8 a.m.; and
  - from 10 p.m. to midnight

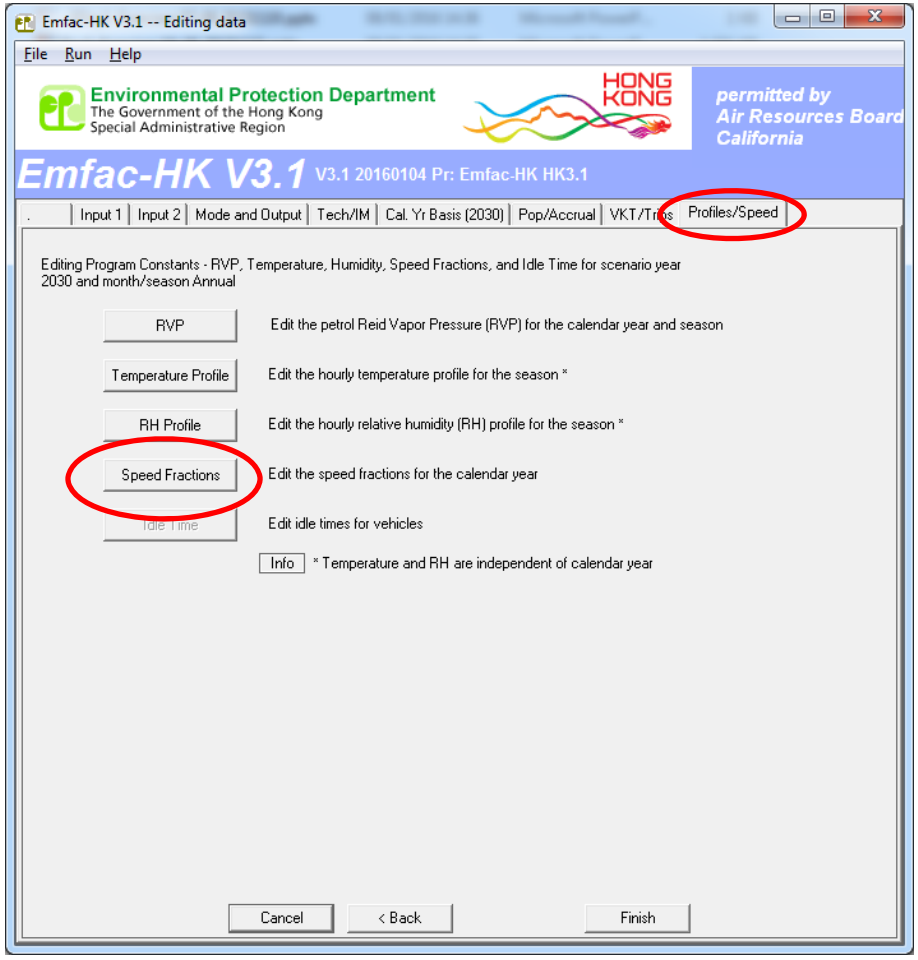
Exercise #6: Speed Distributions

- limited speed distribution:
  - 5% of the VKT occurs at average speed 1-8 km/hr (Speed Bin #1);
  - 25% at 24-32 km/hr (Speed Bin #4);
  - 20% at 48-56 km/hr (Speed Bin #7);
  - 25% at 56-64 km/hr (Speed Bin #8) and
  - 25% at 64-72 km/hr (Speed Bin #9).

Exercise # 6: Speed Distributions

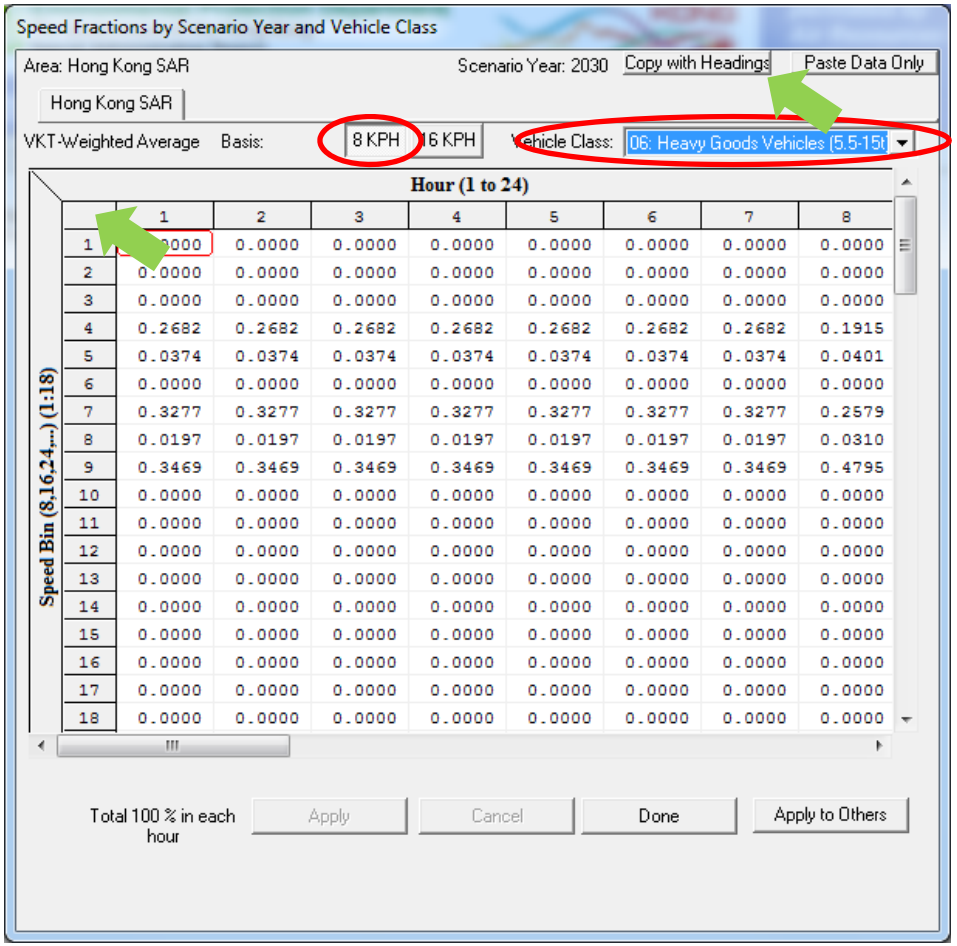
- Base Case (2030, Burden, CSV outputs)
- New case with same scenario data as base case
- Edit Speed Fractions for HGV7
- Apply same Speed Fraction for HGV8

Exercise # 6: Profiles/Speed Tab



Exercise # 6: Editing Speed Fractions

1. Select Vehicle Class;
2. Drag the left-handed corner to select all speed (blue colour);
3. Click button “Copy with Headings”.



- Paste values into Excel worksheet

Exercise # 6: Editing Speed Fractions

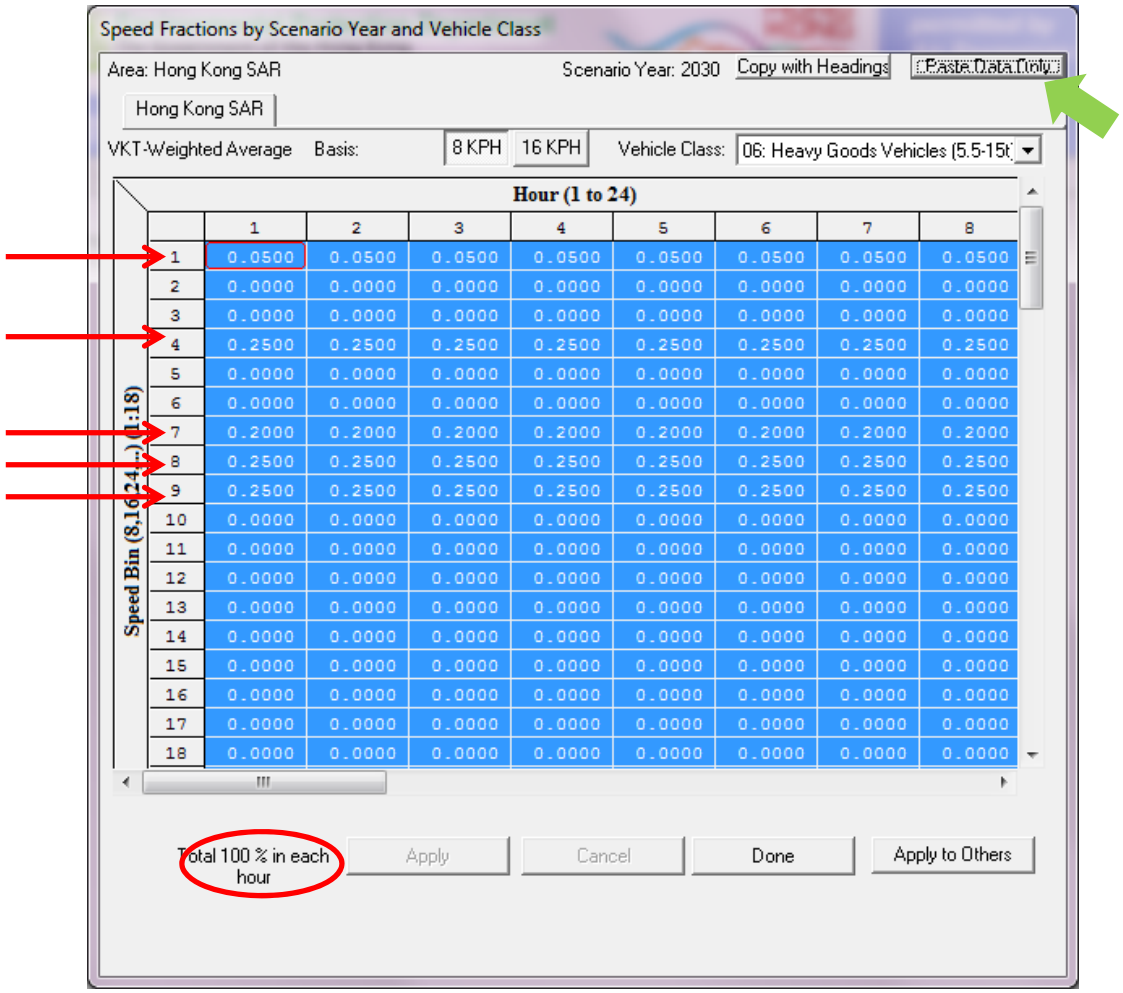
Speed Bin:
1-8 km/hr
9-16
16-24
24-32
32-40
40-48
48-56
56-64
64-72
.
.
.

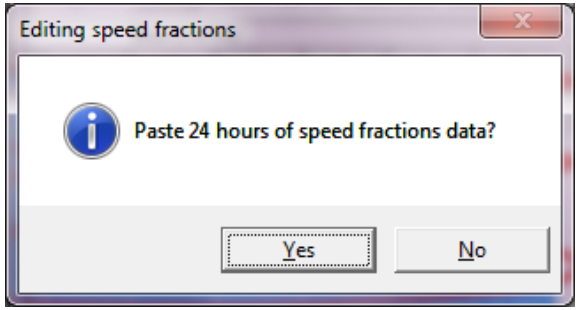
Hour : 00 01 02 03 04 05 06 07 08 09 10 .....

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Vehicle Class 06 Speed Fractions	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
2	Spd008	0	0	0	0	0	0	0	0	1.88E-03	1.88E-03	0	0	0	0	0
3	Spd016	0	0	0	0	0	0	0	0	6.64E-02	6.64E-02	0	0	0	0	0
4	Spd024	0	0	0	0	0	0	0	0	6.88E-02	6.88E-02	0	0	0	0	0
5	Spd032	0.268248	0.268248	0.268248	0.268248	0.268248	0.268248	0.268248	0.191458	0.173041	0.173041	0.191458	0.191458	0.191458	0.191458	0.191458
6	Spd040	3.74E-02	3.74E-02	3.74E-02	3.74E-02	3.74E-02	3.74E-02	3.74E-02	4.01E-02	8.15E-02	8.15E-02	4.01E-02	4.01E-02	4.01E-02	4.01E-02	4.01E-02
7	Spd048	0	0	0	0	0	0	0	0	0.192936	0.192936	0	0	0	0	0
8	Spd056	0.327716	0.327716	0.327716	0.327716	0.327716	0.327716	0.327716	0.257926	8.75E-02	8.75E-02	0.257926	0.257926	0.257926	0.257926	0.257926
9	Spd064	1.97E-02	1.97E-02	1.97E-02	1.97E-02	1.97E-02	1.97E-02	1.97E-02	3.10E-02	0.113836	0.113836	3.10E-02	3.10E-02	3.10E-02	3.10E-02	3.10E-02
10	Spd072	0.346919	0.346919	0.346919	0.346919	0.346919	0.346919	0.346919	0.479484	0.214092	0.214092	0.479484	0.479484	0.479484	0.479484	0.479484
11	Spd080	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Spd088	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	Spd096	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	Spd104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Spd112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Spd120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Spd128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Spd136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Spd144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- From hour 00 to 07 (midnight to 8 a.m.) and hour 22 to 23 (10 p.m. to midnight)
- Speed Fractions:
  5% at Spd008 (1-8 km/hr); 25% at Spd032 (24-32 km/hr);
  20% at Spd056 (48-56 km/hr); 25% at Spd064 (56-64 km/hr) and
  25% at Spd072 (64-72 km/hr).

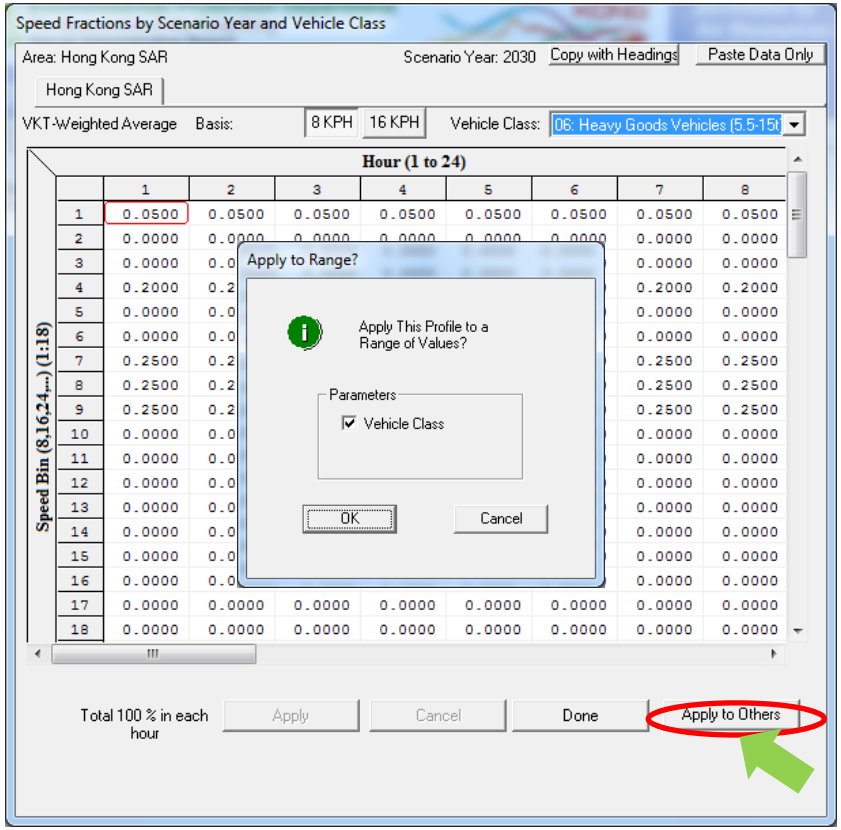
Exercise # 6: Editing Speed Fractions



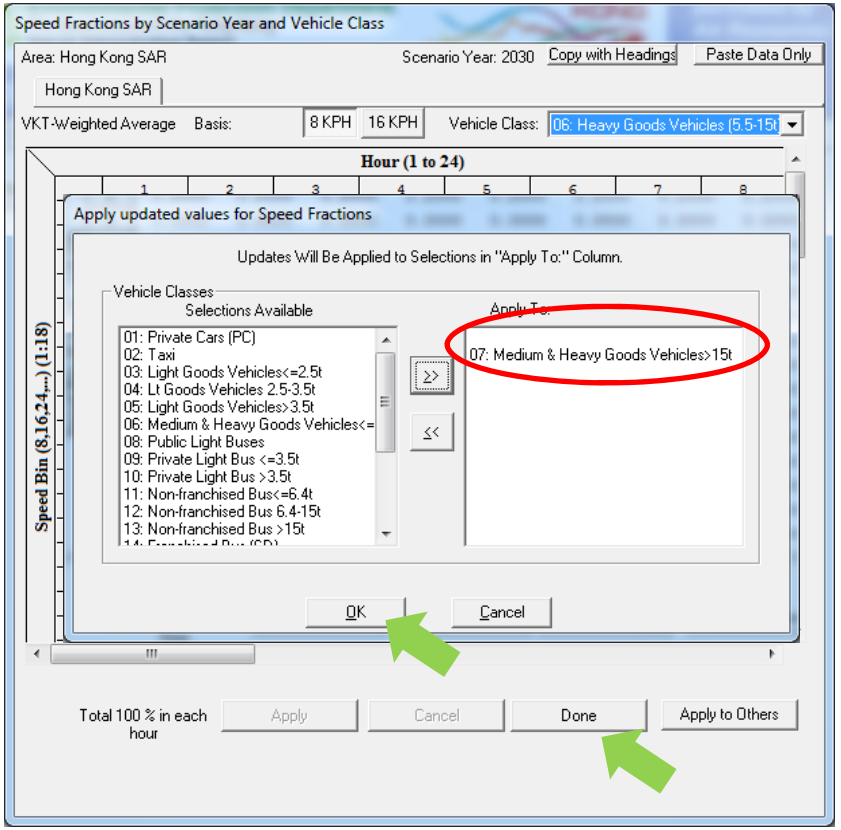


Exercise # 6: Apply Speed Fraction Edits to Other Vehicle Class

Apply to Others



Apply Edit to HGV8



Exercise # 6: Solution

Vehicle	Run Exhaust	Base	#6
HGV7	NOx	1.01276	1.02746
	PM	0.02971	0.03017
HGV8	NOx	2.49435	2.57025
	PM	0.11596	0.11713

Exercise #7: Changing Relative Humidity (RH)

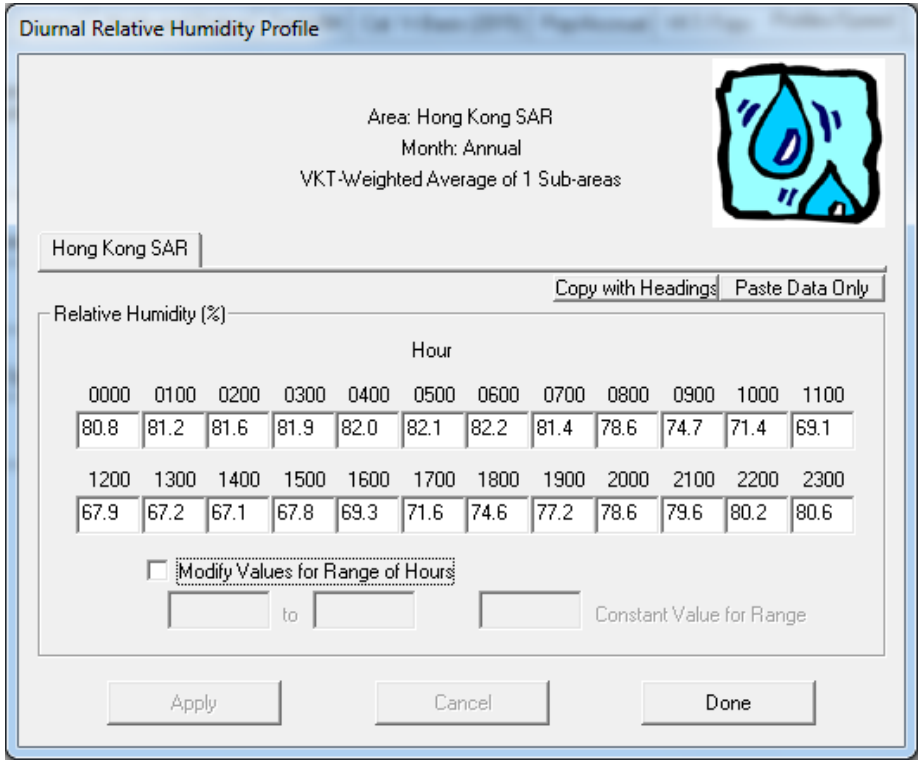
- This exercise shows how to change the annual RH for individual month by editing the input file (INP).

- Monthly average RH of each hour is provided on RH.XLS.

Exercise # 7: Changing RH

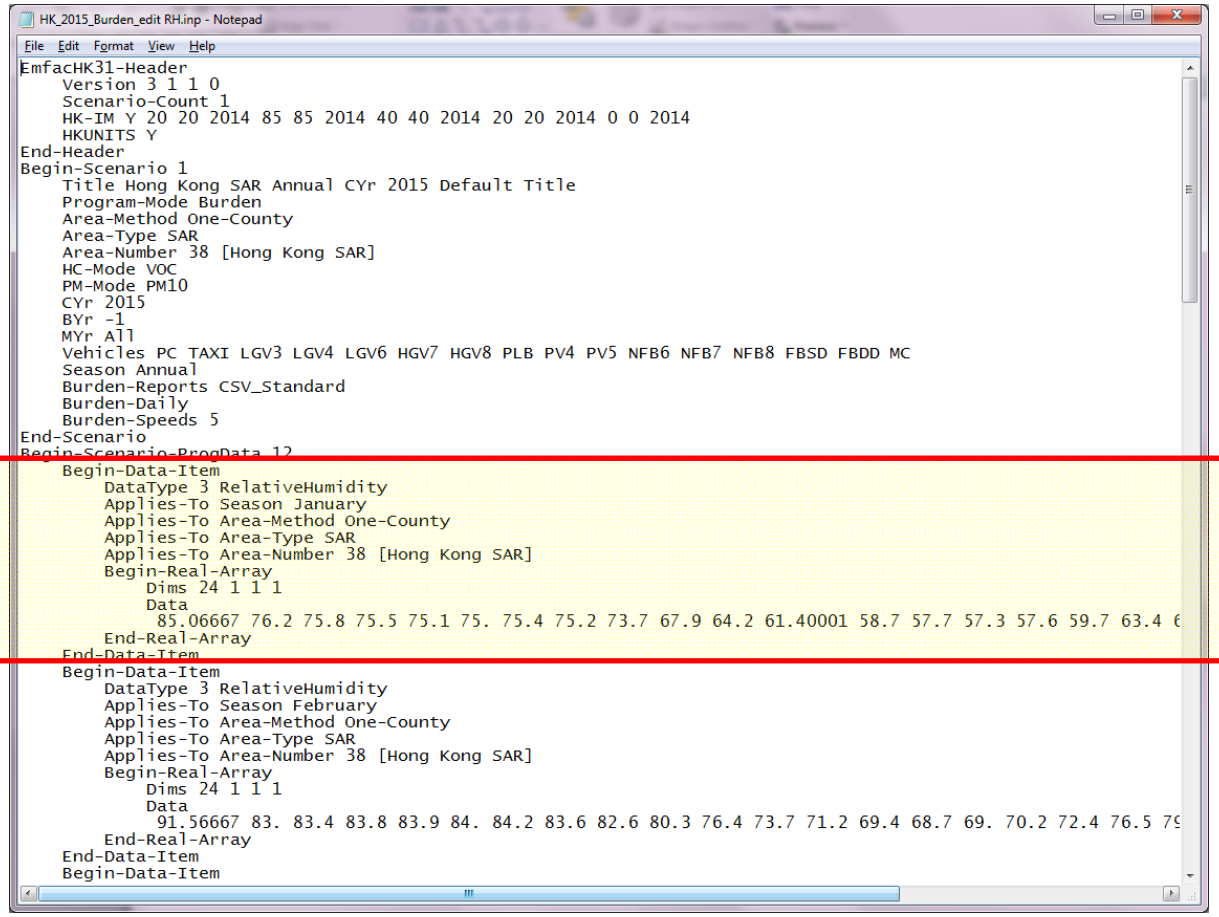
- Create a new case
  - Calendar Years: 2015
  - Scenario Type: BURDEN
  - Output File types: Detailed Emission Estimates (CSV)
  - Pollutants: PM10, VOC
- Alter one of the RH hour value in GUI and save as "HK_2015_Burden_edit RH.INP"
- Update RH for each month in INP

Exercise # 7: Changing RH



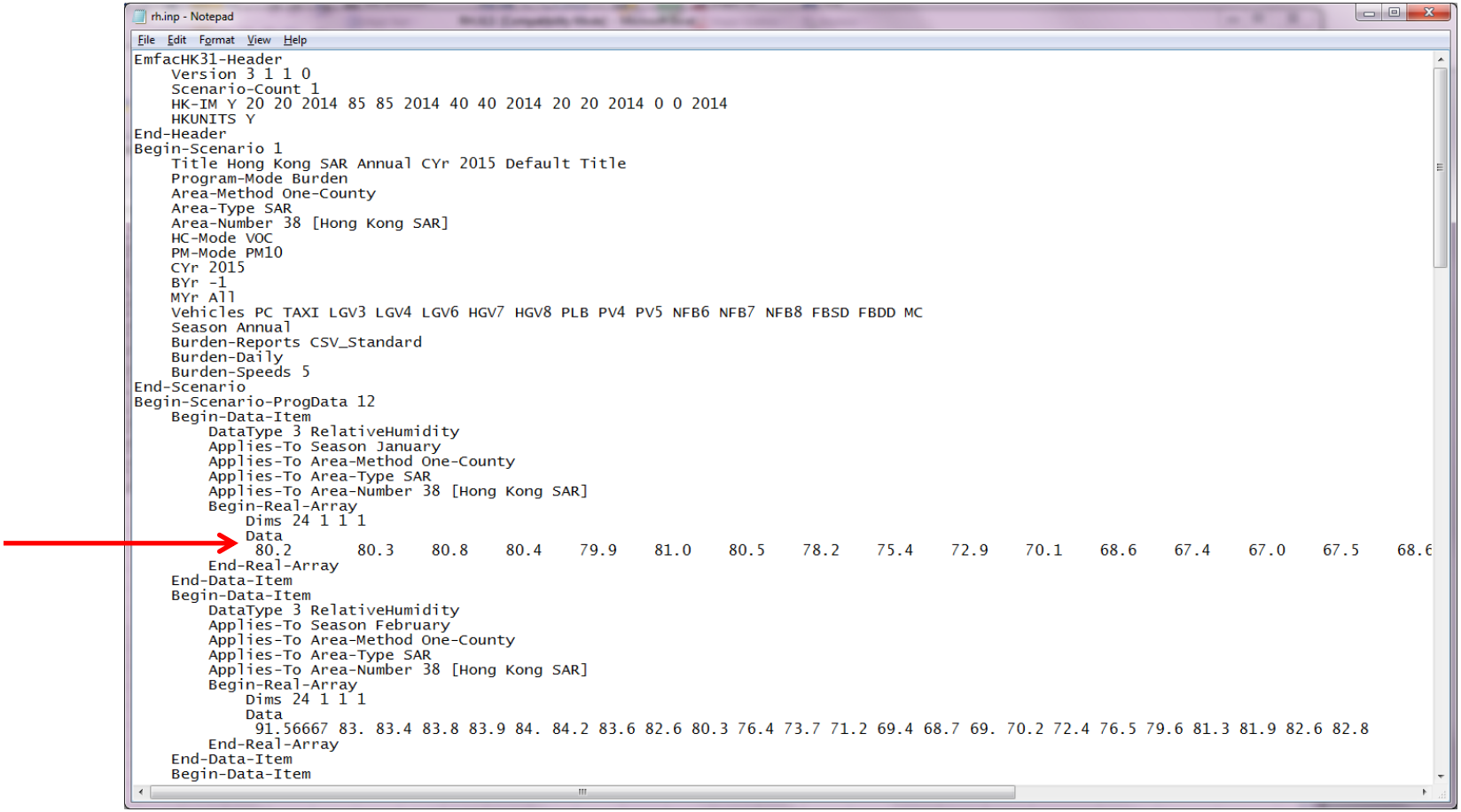
- **Alter RH to 90% at hour 0000**

Exercise # 7: Changing RH



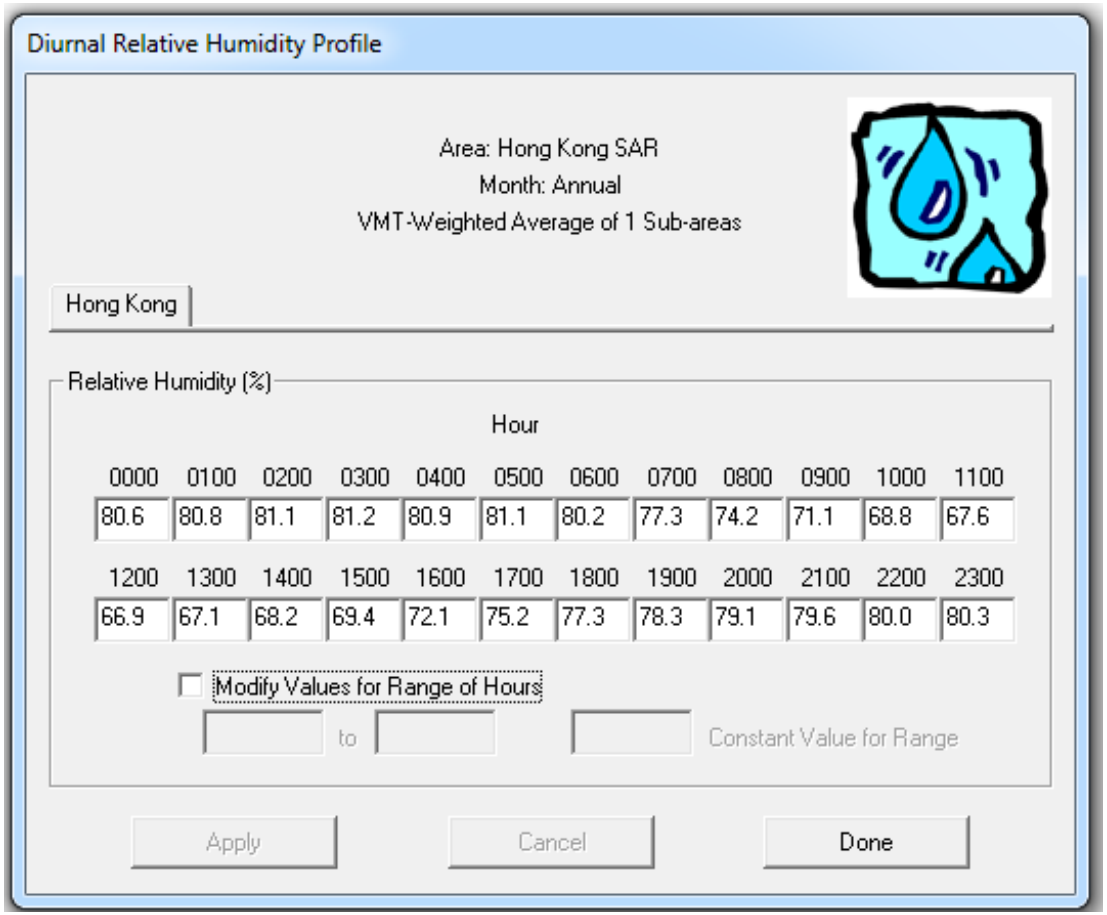
- **Update data row for each month from RH.XLS**

Exercise # 7: Changing RH



- Copy each RH values for each month from Excel and paste into INP file accordingly
- Save the INP and run

Exercise # 7: Changing RH



Advance Exercises

Exercise #8: Alternate Base Year

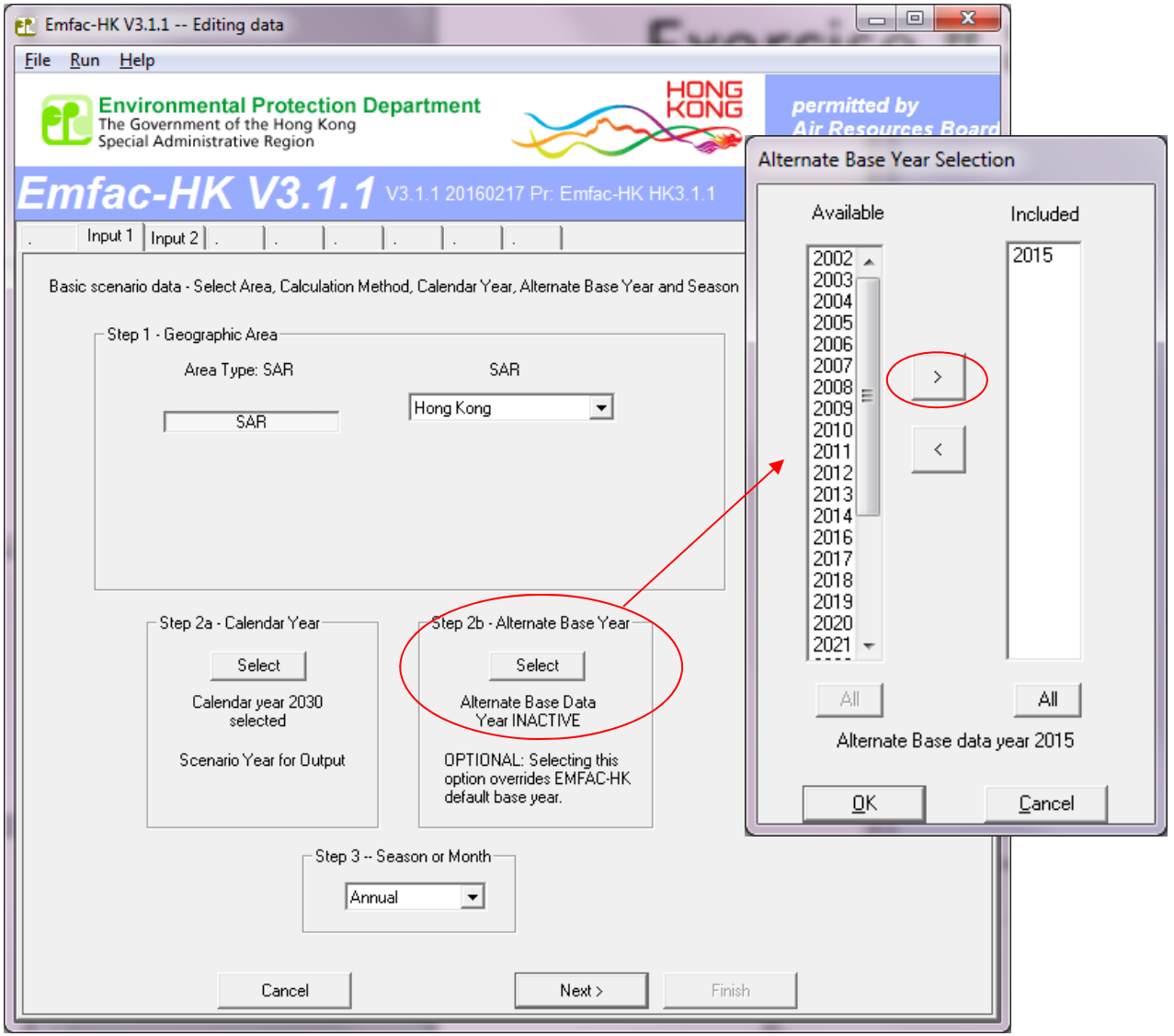
- This exercise shows how to change the alternate base year with new population; then, perform a forecast of these data.

- Scenario data:
  - Calendar year : 2030
  - Alternate base year : 2015
  - Burden; CSV output; Day; PM_{10}; VOC;

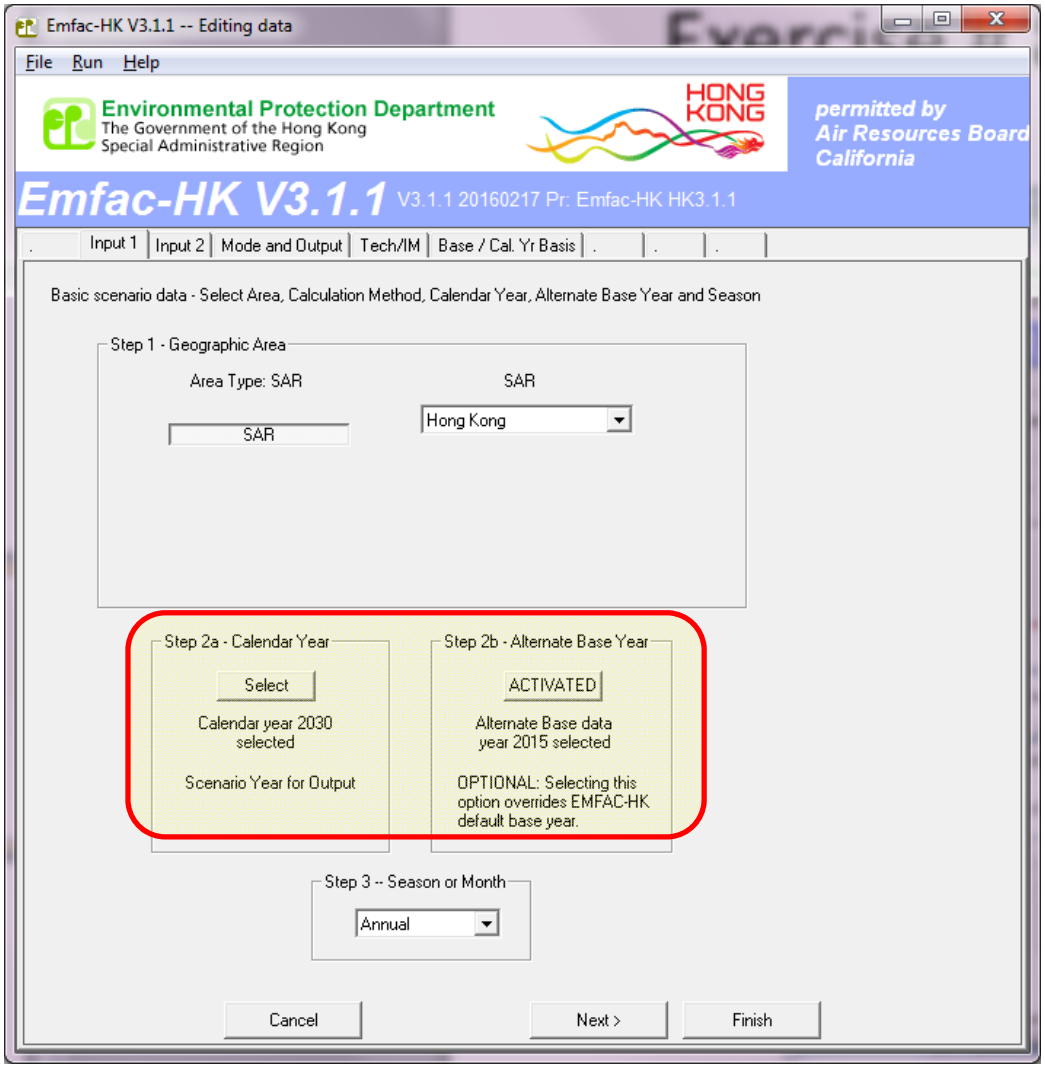
- Alter alternate base year population by 2015_Pop.XLS

Exercise # 8: Alternate Base Year

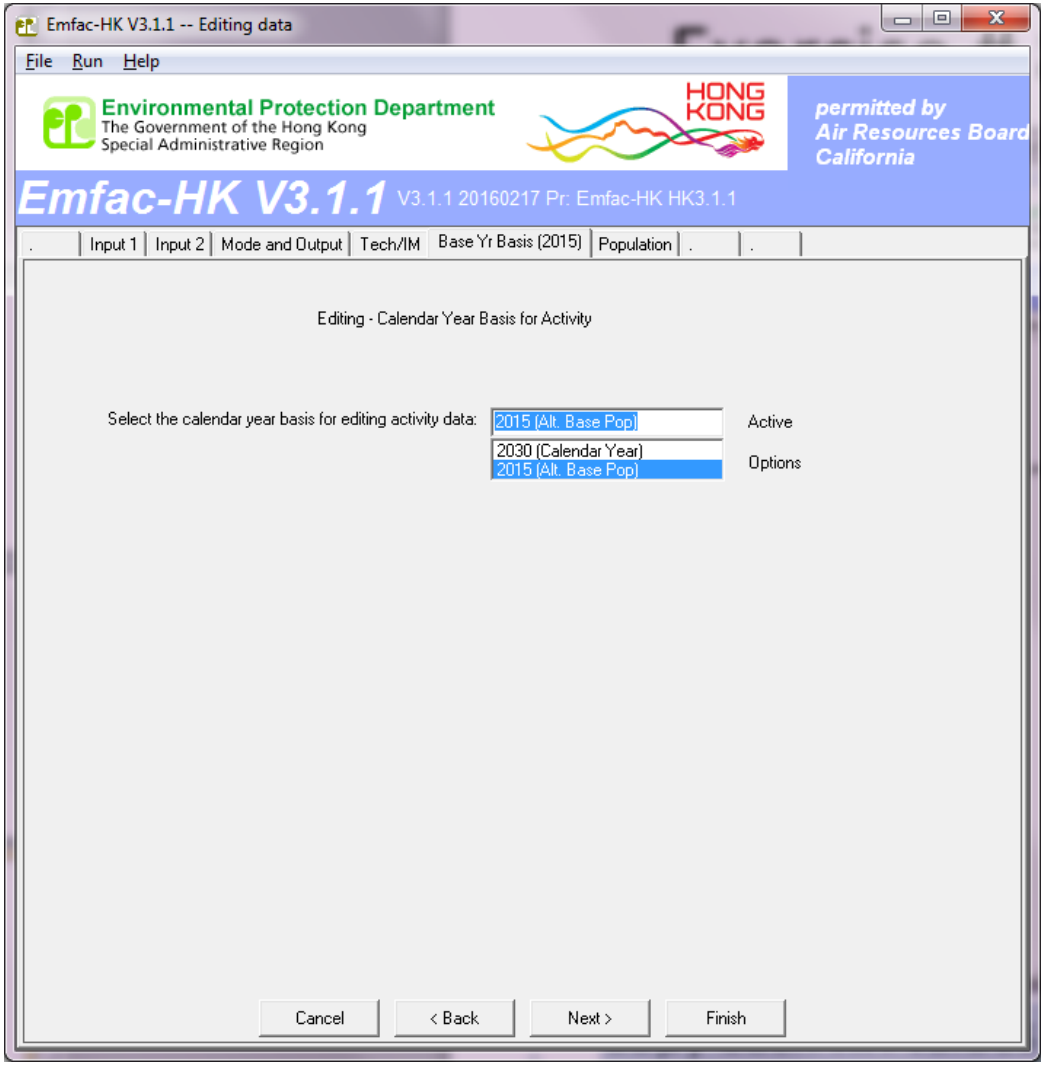
- Alternate Base Year Selection: 2015



Exercise # 8: Alternate Base Year

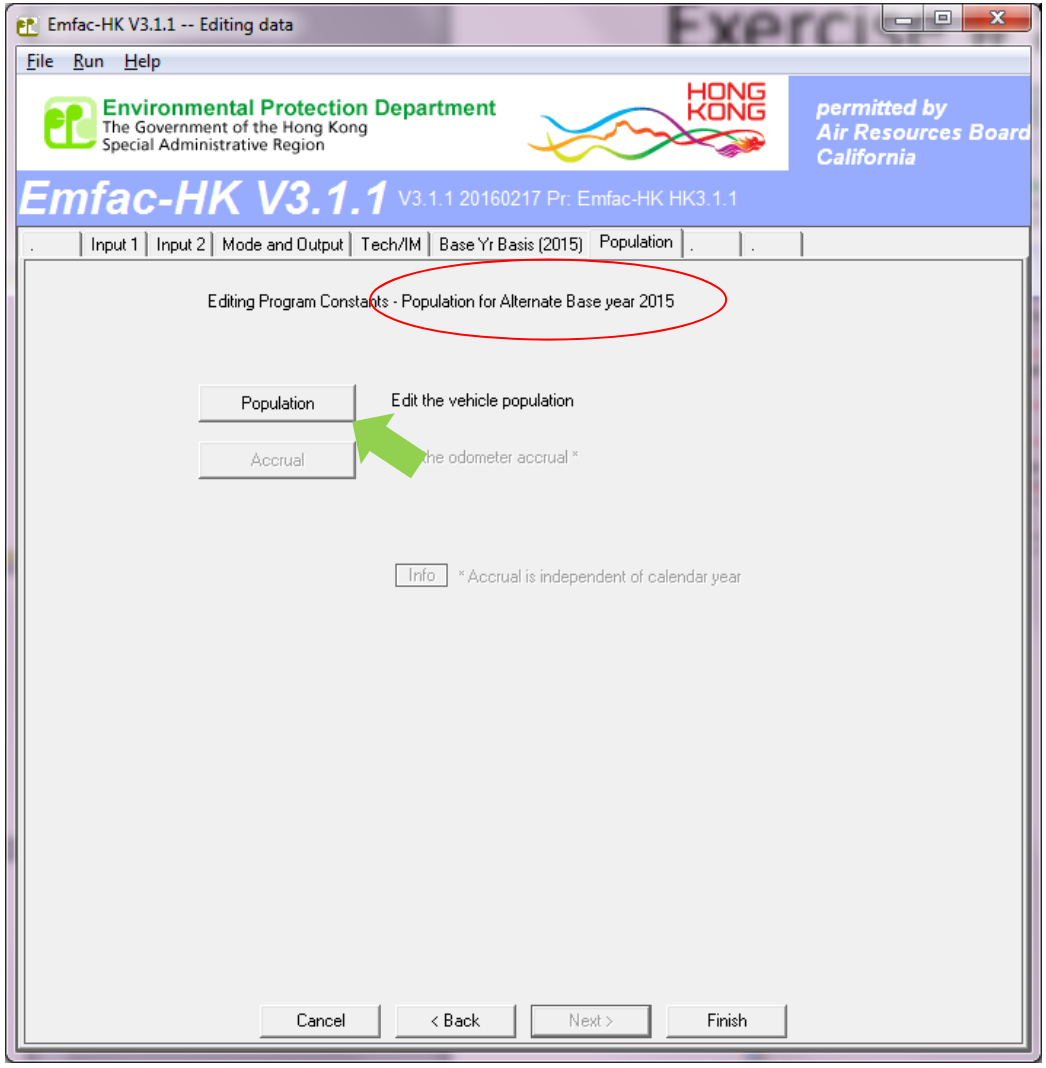


Exercise # 8: Alternate Base Year

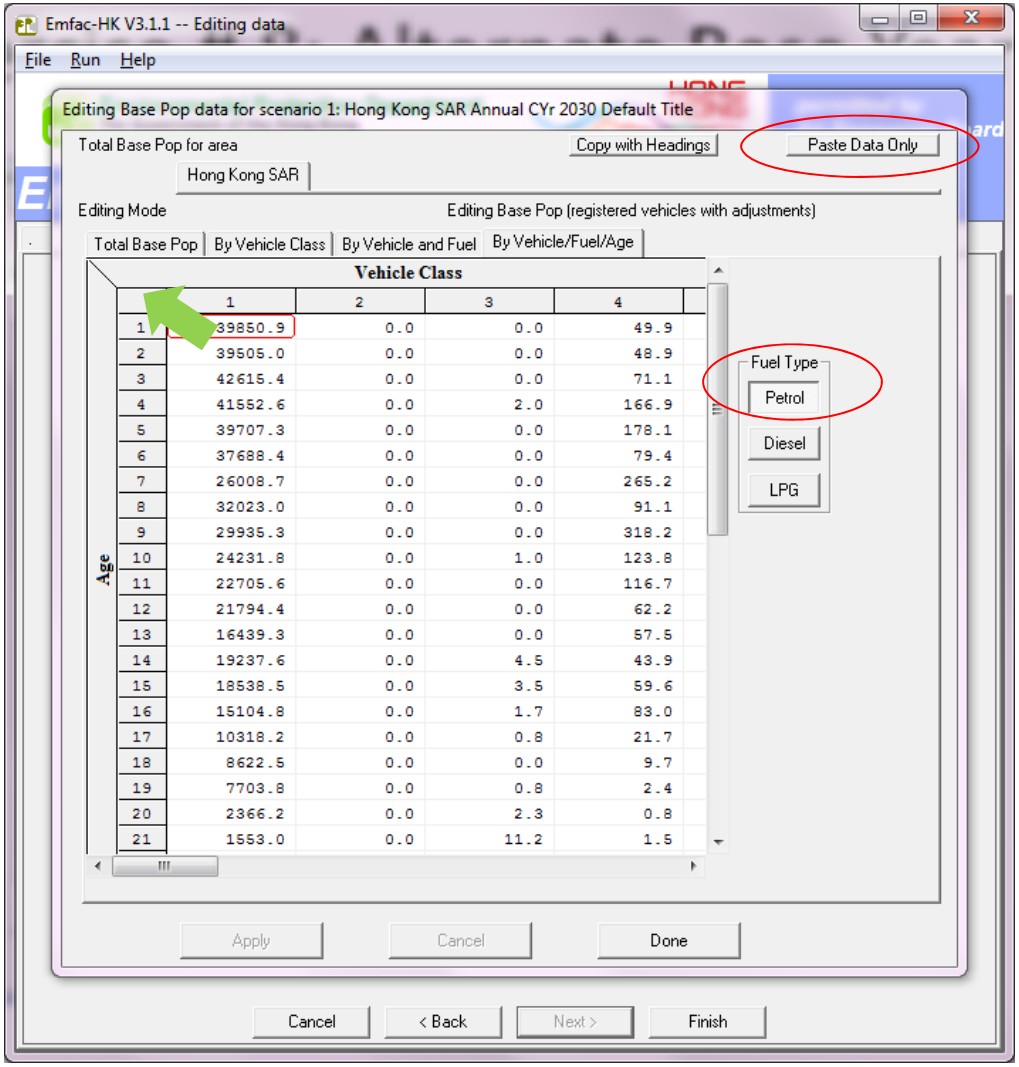


- Select “2015 (Alt. Base Pop)”

Exercise # 8: Alternate Base Year



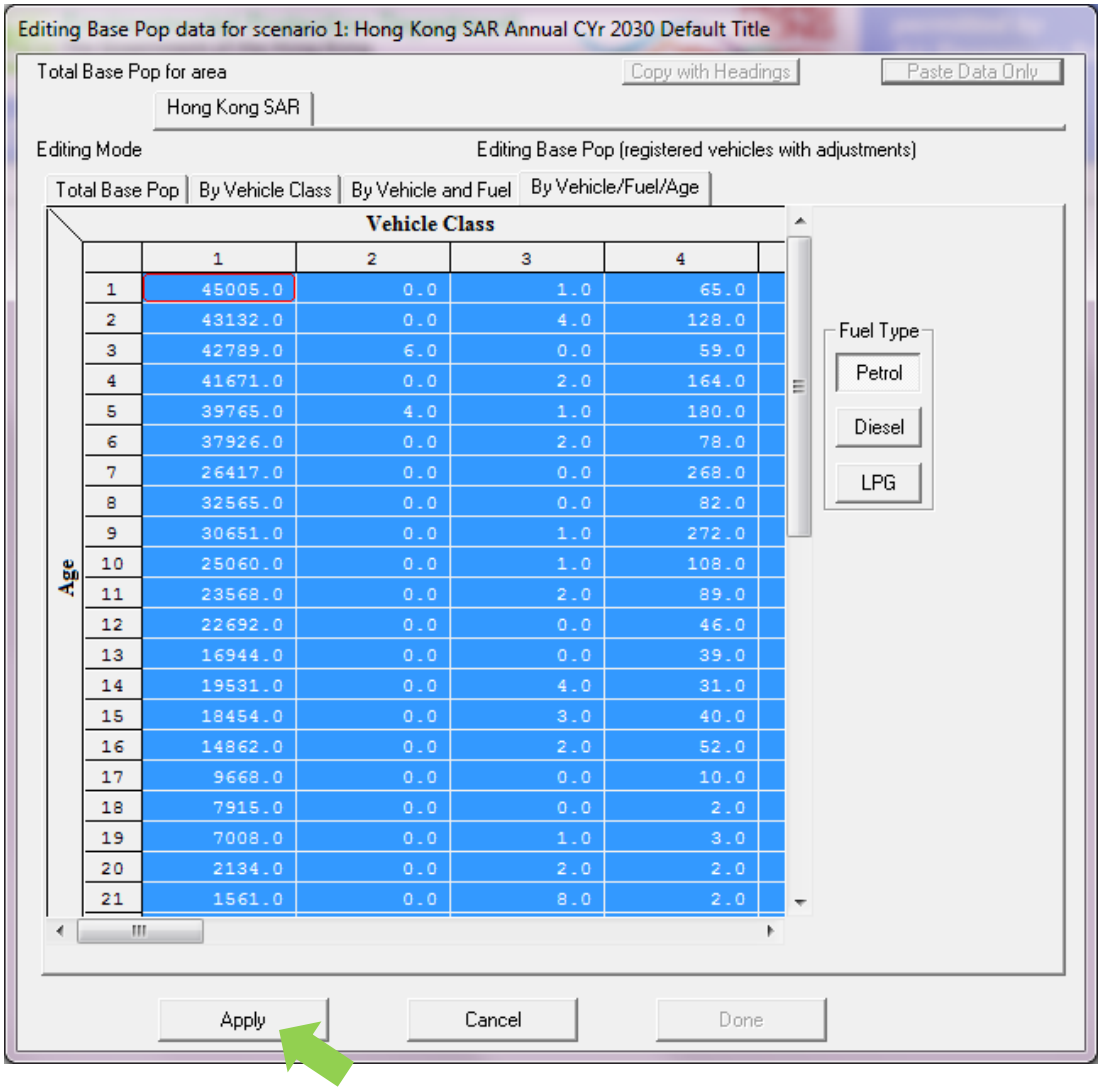
Exercise # 8: Alternate Base Year



Age	1	2	3	4
1	39850.9	0.0	0.0	49.9
2	39505.0	0.0	0.0	48.9
3	42615.4	0.0	0.0	71.1
4	41552.6	0.0	2.0	166.9
5	39707.3	0.0	0.0	178.1
6	37688.4	0.0	0.0	79.4
7	26008.7	0.0	0.0	265.2
8	32023.0	0.0	0.0	91.1
9	29935.3	0.0	0.0	318.2
10	24231.8	0.0	1.0	123.8
11	22705.6	0.0	0.0	116.7
12	21794.4	0.0	0.0	62.2
13	16439.3	0.0	0.0	57.5
14	19237.6	0.0	4.5	43.9
15	18538.5	0.0	3.5	59.6
16	15104.8	0.0	1.7	83.0
17	10318.2	0.0	0.8	21.7
18	8622.5	0.0	0.0	9.7
19	7703.8	0.0	0.8	2.4
20	2366.2	0.0	2.3	0.8
21	1553.0	0.0	11.2	1.5

- Select Fuel Type, drag to highlight all Vehicle Class/Age
- Paste value from 2015_Pop.XLS by individual fuel type

Exercise # 8: Alternate Base Year



Age	1	2	3	4
1	45005.0	0.0	1.0	65.0
2	43132.0	0.0	4.0	128.0
3	42789.0	6.0	0.0	59.0
4	41671.0	0.0	2.0	164.0
5	39765.0	4.0	1.0	180.0
6	37926.0	0.0	2.0	78.0
7	26417.0	0.0	0.0	268.0
8	32565.0	0.0	0.0	82.0
9	30651.0	0.0	1.0	272.0
10	25060.0	0.0	1.0	108.0
11	23568.0	0.0	2.0	89.0
12	22692.0	0.0	0.0	46.0
13	16944.0	0.0	0.0	39.0
14	19531.0	0.0	4.0	31.0
15	18454.0	0.0	3.0	40.0
16	14862.0	0.0	2.0	52.0
17	9668.0	0.0	0.0	10.0
18	7915.0	0.0	0.0	2.0
19	7008.0	0.0	1.0	3.0
20	2134.0	0.0	2.0	2.0
21	1561.0	0.0	8.0	2.0

- Repeat for the rest fuel type
- Save as HK_2030_AltBYr_2015_Burden_edit Pop.inp and run

Exercise #9: Buses Retirement

- This exercise evaluates emission changes franchised double-deck buses older than 15 years are retired from the fleet and replaced with newer buses.

- Two policies to replace retired buses:
  1. All buses age 15 or older replaced with brand new
  2. All buses age 15 or old replaced with 1-5 yr-old buses

Exercise #9: Buses Retirement

- Base Cases (2020, Burden, CSV outputs)
- Copy out FBDD populations by fuel/age from GUI to worksheet and calculate the bus no. for replacement
- 2 New cases with same scenario data as base cases
- Implement different policies

Exercise #10: Link Example

- This exercise compile NOx emission for a road using EMFAC mode.
- Create a Base case at 2030 using EMFAC mode
  - Output File types: RTL
  - Temperature: 20^{o}C
  - Relative Humidity: 70%

Exercise #10: Link Example

- Compile NOx emission factor for each vehicle class at target speed bin from RTL output;
- Given the VTK (km) of each vehicle class, calculate the emission in gram;
- Calculate average emission factor of each road;

Thank you