EXHIBIT F

DECLARATIONS of JAMES G. WILKINSON, PhD

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Introduction

1. I am a Senior Consultant with Golder Associates Inc. (Golder). Golder is a global firm with more than 7,000 employees who provide design, construction, and consulting services related to the earth, environment, and energy. I have a PhD in Engineering and Public Policy from Carnegie Mellon University and a BS in Petroleum Engineering from Montana Tech of the University of Montana. I have 30 years of experience in applied research and directly related technical experience in disciplines spanning the physical sciences, geophysical sciences, mathematics, and computational sciences. My experience includes but is not limited to managing large scale, multidisciplinary applied research projects with multiple stakeholders and sponsors that include projects related to urban-scale air quality, meteorological, and emissions modeling studies. I have worked with the United States Environmental Protection Agency's (US EPA's) family of Motor Vehicle Emission Simulator (MOVES) models since 2010 including MOVES2010a, MOVES2010b, and MOVES2014. My project experience includes the development and quality assurance of inputs to the MOVES model, running the MOVES model, and analyzing the results from the MOVES model for the ten states and associated counties that comprise the Southeastern States Air Resources Managers Inc. (SESARM) whose goal is to foment a better understanding of and to improve air quality in the Southeastern United States. I have used MOVES to estimate on-road mobile source emissions for multiple years in Texas for the Houston 8-hour Ozone SIP Coalition, which is a coalition of petrochemical, energy, and oil and gas exploration and production firms who seek to improve air quality in the greater Houston region. I have also used MOVES to estimate on-road mobile source emissions for thirteen western states to support air quality studies for the Western Regional Air Partnership (WRAP), which is a voluntary partnership of states, tribes, federal land managers, local air agencies and the US EPA whose purpose is to understand current and evolving regional air quality issues in the Western United States. Finally, I have used MOVES to estimate on-road mobile source emissions for the greater Toronto, Ontario region to support air quality modeling studies sponsored by Toronto's Pearson Airport.

2. MOVES2014[1] is US EPA's most recent model that estimates on-road mobile source emissions. MOVES2014 estimates emissions for mobile sources covering a broad range of pollutants over multiple spatial scales including national, county, and project-level analyses. MOVES2014

[1] EPA (2014). MOVES (Motor Vehicle Emission Simulator). MOVES2014 October Release. http://www.epa.gov/oms/models/moves/ (accessed 12-Jun-2015).

includes the benefits of the Tier 3[2],[3] regulations as well the impacts of other EPA rulemakings promulgated since the release of MOVES2010b, new emissions data, and new user requested features.

3. The Urban Air Initiative (UAI) desires to understand how on-road emission estimated by the MOVES2014 model respond to changes in various fuel characteristics related to ethanol-blended fuels. UAI contracted with Golder to conduct sensitivity runs of MOVES2014 to determine the relative changes in on-road mobile source emissions estimates due to changes in various fuel parameters for select regions of the United States (i.e., Kansas City, Minneapolis, and Chicago).

Methods

4. MOVES2014 was obtained from (EPA 2015)[1] and was run on a four core Intel® Core™ i5-3380M system with eight gigabytes of random access memory under a 64-bit Windows 7 Enterprise (Service Pack 1) operating system.

5. Table 1 identifies the cities and counties that UAI selected to run MOVES2014.

Table 1. Counties for Which MOVES2014 was run

City	State	County	FIPS County Code[(a)]
Kansas City	Kansas	Wyandotte	20209
Chicago	Illinois	Cook	17031
Minneapolis	Minnesota	Hennepin	27053

(a) The FIPS county code is a five-digit Federal Information Processing Standard (FIPS) code which uniquely identifies counties and county equivalents in the United States, certain U.S. possessions, and certain freely associated states.

6. On-road mobile source emissions were estimated using MOVES2014 for the year 2017.

7. MOVES2014 provides the option to estimate on-road mobile source emissions based on the following data sets:

    a. County-level default data that are calculated within the MOVES2014 model;

    b. User-supplied county-specific data; and

    c. User-supplied project level data that are typically at the finest resolution and are related to specific roadway segments.

[2] CFR (2014). Control of Air Pollution From Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards; Final Rule. www.gpo.gov/fdsys/pkg/FR-2014-04-28/pdf/2014-06954.pdf (accessed 12-Jun-2015).

[3] EPA (2014). Tier 3 Vehicle Emission and Fuel Standards Program. http://www.epa.gov/oms/tier3.htm (accessed 12-Jun-2015)

8. As the study was concerned with relative changes in the emissions estimates as the fuel characteristics were changed, I determined that the MOVES2014's county-level default fleet, travel, and meteorological data that are a component of the MOVES2014 system were sufficient.

9. Ten different fuels with various ethanol blends were modeled for each of the three areas. Two ethanol-blended fuels for each county were modelled based on the MOVES2014 default fuels specific to those counties. Four ethanol-blended fuels for each county were modelled using fuel parameters derived from the application of the MOVES2014 Fuels Wizard and were based on a county-specific default fuel. Finally, four ethanol-blended fuels were modelled based on fuel formulation parameters provided by UAI. The following details regarding Tables 2, 3, and 4 apply:

   a. Ten fuels were modelled for each city-county.

   b. Each fuel has a numeric identifier listed under the "Fuel" column.

   c. Where the "Source" is "MOVES2014," the MOVES2014 default fuel parameters that are identified by the "Fuel ID" (e.g., Fuel ID 3495) were used to model the on-road mobile source emissions estimates.

   d. Where the "Source" is identified as "Fuels Wizard," the fuel parameter values were derived from the MOVES2014 fuel parameter modelling tool (i.e., MOVES2014 Fuels Wizard) that is provided with the MOVES2014 modeling system. The basis for the fuel parameters used in the Fuels Wizard was the MOVES2014 default fuel parameters identified by the MOVES2014 fuel identifier (e.g., Fuel ID 3495). In these instances, the MOVES2014 Fuels Wizard was used to calculate new fuel parameters by changing only the ethanol content of the attendant base fuel [e.g., Fuel ID 3495] to the ethanol value identified in the table. The Fuels Wizard automatically calculated all of the other fuel parameters in response to the change in ethanol content.

   e. Where the "Source" is identified as "UAI," the fuel parameters were provided by the UAI.

   f. The columns following the "Source" column identify the MOVES2014 fuel parameters that were modelled for each fuel.

10. In regards to the use of the MOVES2014 Fuels Wizard with ethanol-blended fuels above E20 and below E85, I can find no specific statement in the MOVES2014 user and technical documentation concerning whether or not MOVES2014 can accommodate such fuels. However, with this stipulation, I believe it prudent to examine how MOVES2014 emissions estimates respond to ethanol-blended fuels of 25% and 30% ethanol content. Given that these are potential fuels that

may be used in the near future, policy-makers and the public will likely refer to MOVES2014-generated emissions estimates for such fuels whether or not MOVES2014 was specifically formulated to model higher ethanol-content fuels such as E25 and E30.

11. The MOVES2014 fuel parameters that were modelled for Kansas City (Wyandotte County), Kansas are identified in Table 2.

Table 2. Fuel Parameters Used in MOVES2014 for Kansas City

Fuel	Source	Fuel Subtype ID	Reid Vapor Pressure (psi)	Sulfur (ppm)	Ethanol (% vol)	Aromatics (% wt)	Olefin Content (% wt)	Benzene (% wt)	E200 (%)	E300 (%)	T50 (°F)	T90 (°F)
01	Fuels Wizard (Fuel ID 3495)	10	7	10	0	26.84	10.75	0.63	43.24	83.77	213.61	325.9
02	MOVES2014 (Fuel ID 3495)	12	8	10	10	24.82	10.29	0.63	46.31	84.16	207.27	324.13
03	MOVES2014 (Fuel ID 3497)	15	7	10	15	23.48	9.11	0.63	52.44	84.68	194.84	321.76
04	UAI	15	8	10	15	23.48	9.11	0.63	52.44	84.68	194.84	321.76
05	UAI	15	7	10	15	23.48	9.11	0.63	58	84.68	170	321.76
06	UAI	18	7	10	20	22.1	8.9	0.63	57	85.5	182	319.7
07	UAI	18	7	10	20	22.1	8.9	0.63	58.5	85.5	165	319.7
08[a]	Fuels Wizard (Fuel ID 3497)	18	7	10	20	23.03	8.72	0.63	54.48	84.86	190.67	320.97
09[a]	Fuels Wizard (Fuel ID 3497)	18	7	10	25	23.03	8.72	0.63	54.48	84.86	190.67	320.97
10[a]	Fuels Wizard (Fuel ID 3497)	18	7	10	30	23.03	8.72	0.63	54.48	84.86	190.67	320.97

(a) For fuels 08, 09, and 10, the MOVES Fuels Wizard was used. For these fuels, the default fuel (i.e., 3497) was the basis fuel that was input to the MOVES Fuel Wizard. In each fuel, only the ethanol content was changed. As can be observed, the MOVES Fuels Wizard predicted no change in the fuel formulation parameters as ethanol was changed from 20% to 25% to 30%.

12. The MOVES2014 fuel parameters that were modelled for Chicago (Cook County), Illinois are identified in Table 3.

Table 3. Fuel Parameters Used in MOVES2014 for Chicago

Fuel	Source	Fuel Subtype ID	Reid Vapor Pressure (psi)	Sulfur (ppm)	Ethanol (% vol)	Aromatics (% wt)	Olefin Content (% wt)	Benzene (% wt)	E200 (%)	E300 (%)	T50 (°F)	T90 (°F)
01	Fuels Wizard (Fuel ID 3571)	10	5.9	10	0	19.17	8.31	0.6	47.87	84.82	204.16	321.13
02	MOVES2014	12	6.9	10	10	17.15	7.85	0.6	50.98	85.21	197.82	319.36

	(Fuel ID 3571)											
03	MOVES2014 (Fuel ID 3573)	15	6.9	10	15	15.81	6.67	0.6	57.11	85.73	185.39	316.99
04	UAI	15	6.9	10	15	15.81	6.67	0.6	58	85.73	170	316.99
05	UAI	18	6.9	10	20	14.7	6.2	0.6	57.8	86.8	175	314.5
06	UAI	18	6.9	10	20	14.7	6.2	0.6	59	86.8	165	314.5
07	UAI	12	8.4	10	10	17.15	7.85	0.6	50.98	85.21	197.82	319.36
08[(a)]	Fuels Wizard (Fuel ID 3573)	18	6.9	10	20	15.36	6.28	0.6	59.11	85.91	181.22	316.2
09[(a)]	Fuels Wizard (Fuel ID 3573)	18	6.9	10	25	15.36	6.28	0.6	59.11	85.91	181.22	316.2
10[(a)]	Fuels Wizard (Fuel ID 3573)	18	6.9	10	30	15.36	6.28	0.6	59.11	85.91	181.22	316.2

(a) For fuels 08, 09, and 10, the MOVES Fuels Wizard was used. For these fuels, the default fuel (i.e., 3573) was the basis fuel that was input to the MOVES Fuel Wizard. In each fuel, only the ethanol content was changed. As can be observed, the MOVES Fuels Wizard predicted no change in the fuel formulation parameters as ethanol was changed from 20% to 25% to 30%.

13. The MOVES2014 fuel parameters that were modelled for Minneapolis (Hennepin County), Minnesota are identified in Table 4.

Table 4. Fuel Parameters Used in MOVES2014 for Minneapolis

Fuel	Source	Fuel Subtype ID	Reid Vapor Pressure (psi)	Sulfur (ppm)	Ethanol (% vol)	Aromatics (% wt)	Olefin Content (% wt)	Benzene (% wt)	E200 (%)	E300 (%)	T50 (°F)	T90 (°F)
01	Fuels Wizard (Fuel ID 3504)	10	8.7	10	0	24.3	8.18	0.86	47.24	81.1	205.44	338.04
02	MOVES2014 (Fuel ID 3504)	12	9.7	10	10	22.28	7.72	0.86	50.31	81.49	199.1	336.27
03	MOVES2014 (Fuel ID 3506)	15	8.7	10	15	20.94	6.54	0.86	56.44	82.01	186.67	333.9
04	UAI	18	8.7	10	20	19.7	6.1	0.86	58	82.5	174	331.5
05	UAI	18	8.7	10	20	19.7	6.1	0.86	59.5	82.5	158	331.5
06	UAI	15	9.7	10	15	20.94	6.54	0.86	58.7	82.01	165	333.9
07	UAI	10	9.7	10	0	22.28	7.72	0.86	50.31	81.49	199.1	336.27
08[(a)]	Fuels Wizard (Fuel ID 3506)	18	8.7	10	20	20.49	6.15	0.86	58.49	82.19	182.5	333.11
09[(a)]	Fuels Wizard (Fuel ID 3506)	18	8.7	10	25	20.49	6.15	0.86	58.49	82.19	182.5	333.11
10[(a)]	Fuels Wizard (Fuel ID 3506)	18	8.7	10	30	20.49	6.15	0.86	58.49	82.19	182.5	333.11

(a) For fuels 08, 09, and 10, the MOVES Fuels Wizard was used. For these fuels, the default fuel (i.e., 3506) was the basis fuel that was input to the MOVES Fuel Wizard. In each fuel, only the ethanol content was changed. As can be observed, the MOVES Fuels Wizard predicted no change in the fuel formulation parameters as ethanol was changed from 20% to 25% to 30%.

14. For each set of fuel formulation parameters identified in Tables 2, 3, and 4, MOVES2014 was run to estimate on-road mobile source emissions for a June 2017 weekday and weekend day. Emissions were estimated for all MOVES2014 gasoline-fueled source types (e.g., motorcycle, passenger car). Finally, emissions were estimated for each process type (e.g., crankcase running exhaust, evaporative fuel leaks).

Results

15. Table 5 presents the MOVES2014 emissions estimates for June weekday in 2017 using the default data (i.e., Fuel 02 and Fuel 03) and for each fuel formulation parameter sensitivity run for Kansas City (Wyandotte County), Kansas.

16. Table 6 presents the MOVES2014 emissions estimates for June weekday in 2017 using the default data (i.e., Fuel 02 and Fuel 03) and for each fuel formulation parameter sensitivity run for Chicago (Cook County), Illinois.

17. Table 7 presents the MOVES2014 emissions estimates for June weekday in 2017 using the default data (i.e., Fuel 02 and Fuel 03) and for each fuel formulation parameter sensitivity run for Minneapolis (Hennepin County), Minnesota.

18. The *Exhaust Processes* in Tables 5, 6, and 7 include crankcase running exhaust, crankcase start exhaust, running exhaust, and start exhaust. The *Evaporative Processes* in Tables 5, 6, and 7 include evaporative fuel leaks, evaporative fuel vapor venting, and evaporative permeation.

19. For each county, weekend emissions exhibit similar trends to those for the weekday; however, the weekend emissions mass is predicted to be lower by 10% to 30% depending on pollutant.

Table 5. MOVES2014 Emissions Estimates for Each set of Fuel Formulation Parameters for Kansas City (Wyandotte County), Kansas for a June Weekday in 2017. The Contents of the *Fuel* Column are Consistent Between This Table and Table 2.

Fuel	MOVES2014 Emissions Estimates (tons per day)															
	Exhaust Processes						Evaporative Processes			Total All Processes						
	Benzene	Ethanol	VOC	NOx	PM10	PM2.5	SO2	Benzene	Ethanol	VOC	Benzene	Ethanol	VOC	NOx	PM10	PM2.5	SO2
01	0.067	0.002	1.39	2.34	0.043	0.038	0.014	0.0036	0.000	0.66	0.071	0.002	2.06	2.34	0.043	0.038	0.014
02	0.059	0.040	1.41	2.52	0.046	0.040	0.015	0.0050	0.197	0.86	0.064	0.237	2.27	2.52	0.046	0.040	0.015
03	0.057	0.059	1.39	2.60	0.046	0.041	0.015	0.0044	0.200	0.88	0.061	0.259	2.27	2.60	0.046	0.041	0.015
04	0.056	0.058	1.38	2.62	0.046	0.041	0.015	0.0050	0.197	0.90	0.061	0.255	2.28	2.62	0.046	0.041	0.015
05	0.057	0.060	1.35	2.59	0.047	0.041	0.015	0.0051	0.269	0.88	0.062	0.329	2.23	2.59	0.047	0.041	0.015
06	0.059	0.074	1.51	2.73	0.047	0.042	0.015	0.0051	0.269	0.92	0.064	0.343	2.44	2.73	0.047	0.042	0.015
07	0.060	0.077	1.49	2.72	0.048	0.042	0.015	0.0051	0.269	0.92	0.065	0.346	2.42	2.72	0.048	0.042	0.015
08	0.061	0.073	1.56	2.74	0.048	0.043	0.015	0.0051	0.333	0.92	0.066	0.406	2.48	2.74	0.048	0.043	0.015
09	0.069	0.071	1.82	2.91	0.051	0.045	0.015	0.0050	0.400	0.95	0.074	0.471	2.77	2.91	0.051	0.045	0.015
10	0.081	0.068	2.21	3.13	0.054	0.048	0.015	0.0047	0.373	0.98	0.085	0.441	3.19	3.13	0.054	0.048	0.015

Table 6. MOVES2014 Emissions Estimates for Each set of Fuel Formulation Parameters for Chicago (Cook County), Illinois for a June Weekday in 2017. The Contents of the *Fuel* Column are Consistent Between This Table and Table 3.

Fuel	MOVES2014 Emissions Estimates (tons per day)															
	Exhaust Processes						Evaporative Processes			Total All Processes						
	Benzene	Ethanol	VOC	NOx	PM10	PM2.5	SO2	Benzene	Ethanol	VOC	Benzene	Ethanol	VOC	NOx	PM10	PM2.5	SO2
01	0.873	0.028	20.51	35.05	0.634	0.561	0.255	0.0642	0.000	11.12	0.937	0.028	31.63	35.05	0.634	0.561	0.255
02	0.759	0.620	20.53	38.06	0.673	0.595	0.265	0.0748	2.092	14.04	0.834	2.711	34.56	38.06	0.673	0.595	0.265
03	0.719	0.946	20.44	39.72	0.685	0.606	0.271	0.0776	3.203	14.68	0.797	4.149	35.12	39.72	0.685	0.606	0.271
04	0.726	0.968	20.20	39.59	0.687	0.608	0.271	0.0776	3.203	14.68	0.804	4.171	34.88	39.59	0.687	0.608	0.271
05	0.751	1.229	22.41	41.77	0.703	0.622	0.276	0.0795	4.390	15.33	0.830	5.619	37.74	41.77	0.703	0.622	0.276
06	0.758	1.271	22.32	41.71	0.706	0.624	0.276	0.0795	4.390	15.33	0.837	5.661	37.65	41.71	0.706	0.624	0.276
07	0.733	0.608	20.40	38.44	0.673	0.595	0.265	0.0643	2.135	14.40	0.797	2.743	34.80	38.44	0.673	0.595	0.265
08	0.769	1.208	22.90	42.00	0.713	0.631	0.276	0.0795	4.390	15.33	0.849	5.598	38.23	42.00	0.713	0.631	0.276
09	0.851	1.198	26.38	44.83	0.750	0.664	0.276	0.0790	5.453	15.85	0.930	6.651	42.23	44.83	0.750	0.664	0.276
10	0.987	1.219	31.85	48.30	0.790	0.699	0.276	0.0774	6.577	16.36	1.065	7.796	48.21	48.30	0.790	0.699	0.276

Table 7. MOVES2014 Emissions Estimates for Each set of Fuel Formulation Parameters for Minneapolis (Hennepin County), Minnesota for a June Weekday in 2017. The Contents of the *Fuel* Column are Consistent Between This Table and Table 4.

Fuel	MOVES2014 Emissions Estimates (tons per day)																
	Exhaust Processes							Evaporative Processes			Total All Processes						
	Benzene	Ethanol	VOC	NOx	PM10	PM2.5	SO2	Benzene	Ethanol	VOC	Benzene	Ethanol	VOC	NOx	PM10	PM2.5	SO2
01	0.350	0.008	7.45	13.92	0.270	0.238	0.084	0.0244	0.000	3.84	0.374	0.008	11.29	13.92	0.270	0.350	0.008
02	0.313	0.210	7.66	15.04	0.287	0.254	0.088	0.0260	0.718	4.89	0.339	0.928	12.55	15.04	0.287	0.313	0.210
03	0.308	0.322	7.75	15.55	0.292	0.258	0.090	0.0296	1.076	4.98	0.338	1.399	12.73	15.55	0.292	0.308	0.322
04	0.326	0.414	8.62	16.30	0.299	0.265	0.092	0.0296	1.476	5.20	0.356	1.891	13.82	16.30	0.299	0.326	0.414
05	0.334	0.444	8.61	16.26	0.303	0.268	0.092	0.0296	1.476	5.20	0.364	1.920	13.81	16.26	0.303	0.334	0.444
06	0.307	0.329	7.61	15.58	0.294	0.260	0.090	0.0259	1.101	5.11	0.333	1.429	12.72	15.58	0.294	0.307	0.329
07	0.323	0.008	7.21	13.82	0.259	0.229	0.084	0.0224	0.000	3.97	0.346	0.008	11.17	13.82	0.259	0.323	0.008
08	0.334	0.406	8.80	16.40	0.304	0.269	0.092	0.0296	1.476	5.20	0.363	1.882	14.00	16.40	0.304	0.334	0.406
09	0.374	0.391	10.30	17.45	0.321	0.284	0.092	0.0285	1.838	5.38	0.403	2.228	15.67	17.45	0.321	0.374	0.391
10	0.441	0.376	12.63	18.74	0.340	0.300	0.092	0.0269	2.220	5.55	0.468	2.596	18.18	18.74	0.340	0.441	0.376

20. Bar charts of the emissions mass by pollutant and ethanol fuel content were prepared. As weekday and weekend day emissions estimated by MOVES2014 exhibit similar trends, though with weekend day emissions estimates being lower, only the bar charts for the weekday emissions estimates are presented.

21. Figure 1 presents bar charts of MOVES2014 on-road mobile source exhaust emissions estimates for each pollutant for Kansas City (Wyandotte County), Kansas for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed with exhaust emissions estimates with increasing fuel content (i.e., moving from E0 to E10 to E15 through E30):

    a. VOC emissions are relatively flat for E0 to E15 fuels but trend up from E20 to E30 fuels;

    b. NOX, PM10, PM2.5 and SO2 emissions trend up from E0 to E30 fuels;

    c. Benzene emissions trend down from E0 to E15 fuels and trend up from E20 to E30 fuels; and

    d. Ethanol emissions trend up from E0 to E20 fuels and trend down from E25 to E30 fuels.

22. Figure 2 presents bar charts of MOVES2014 on-road mobile source evaporative emissions estimates for each pollutant for Kansas City (Wyandotte County), Kansas for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed with evaporative emissions estimates with increasing fuel content:

    a. VOC emissions trend up from E0 to E30 fuels;

    b. Benzene emissions trend up from E0 to E20 fuels and trend down from E25 to E30 fuels; and

    c. Ethanol emissions trend up from E0 to E25 fuels and trend down with the E30 fuel.

23. Figure 3 presents bar charts of MOVES2014 on-road mobile source total (i.e., exhaust plus evaporative) emissions estimates for Kansas City (Wyandotte County), Kansas for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed with total (exhaust plus evaporative) emissions estimates with increasing fuel content:

    a. VOC, ethanol, NOX, PM10, PM2.5 and SO2 emissions trend up from E0 to E30 fuels; and

    b. Benzene emissions trend down from E0 to E15 fuels and trend up from E20 to E30 fuels.

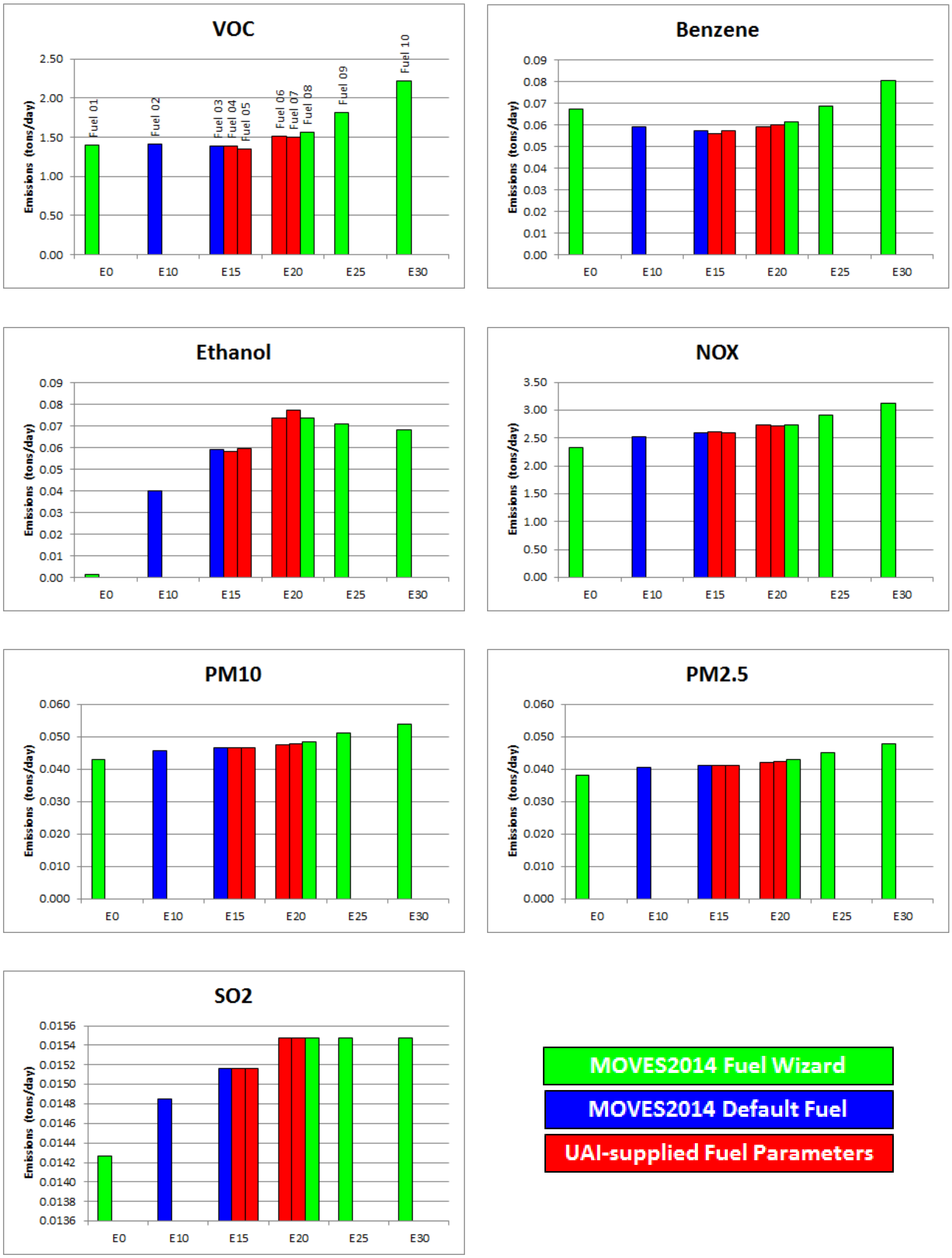

Figure 1. Bar charts of exhaust emissions estimates for Kansas City (Wyandotte County), Kansas for a June weekday in 2017.

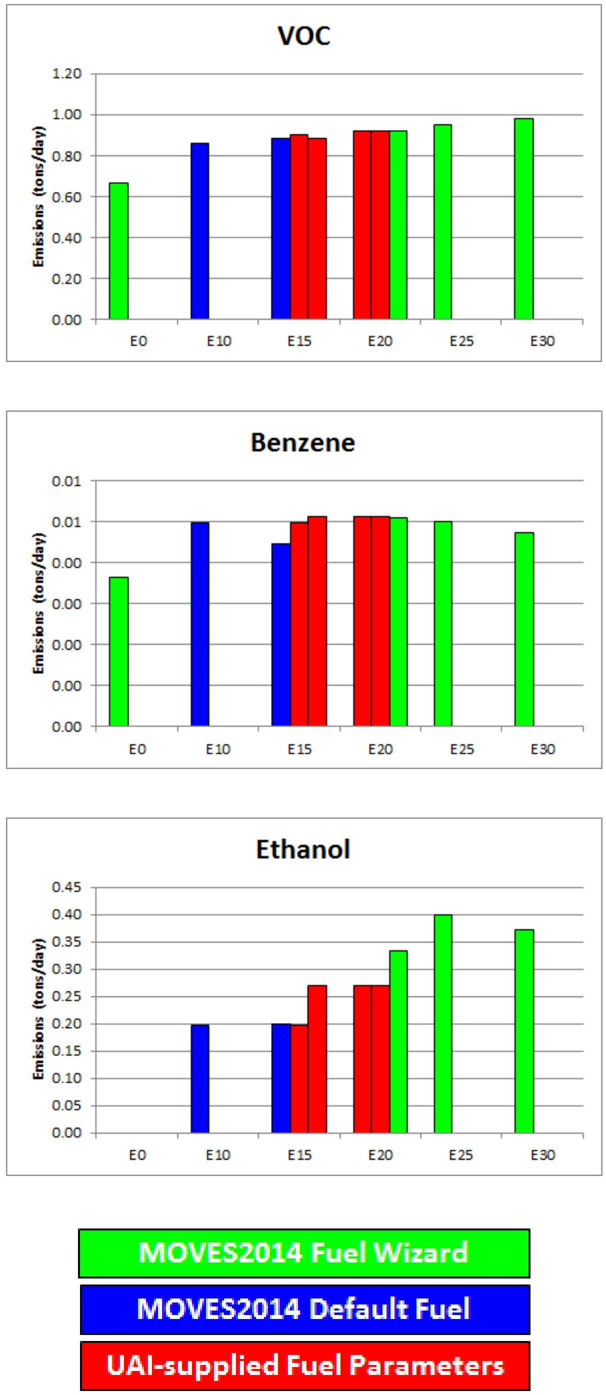

Figure 2. Bar charts of evaporative emissions estimates for Kansas City (Wyandotte County), Kansas for a June weekday in 2017.

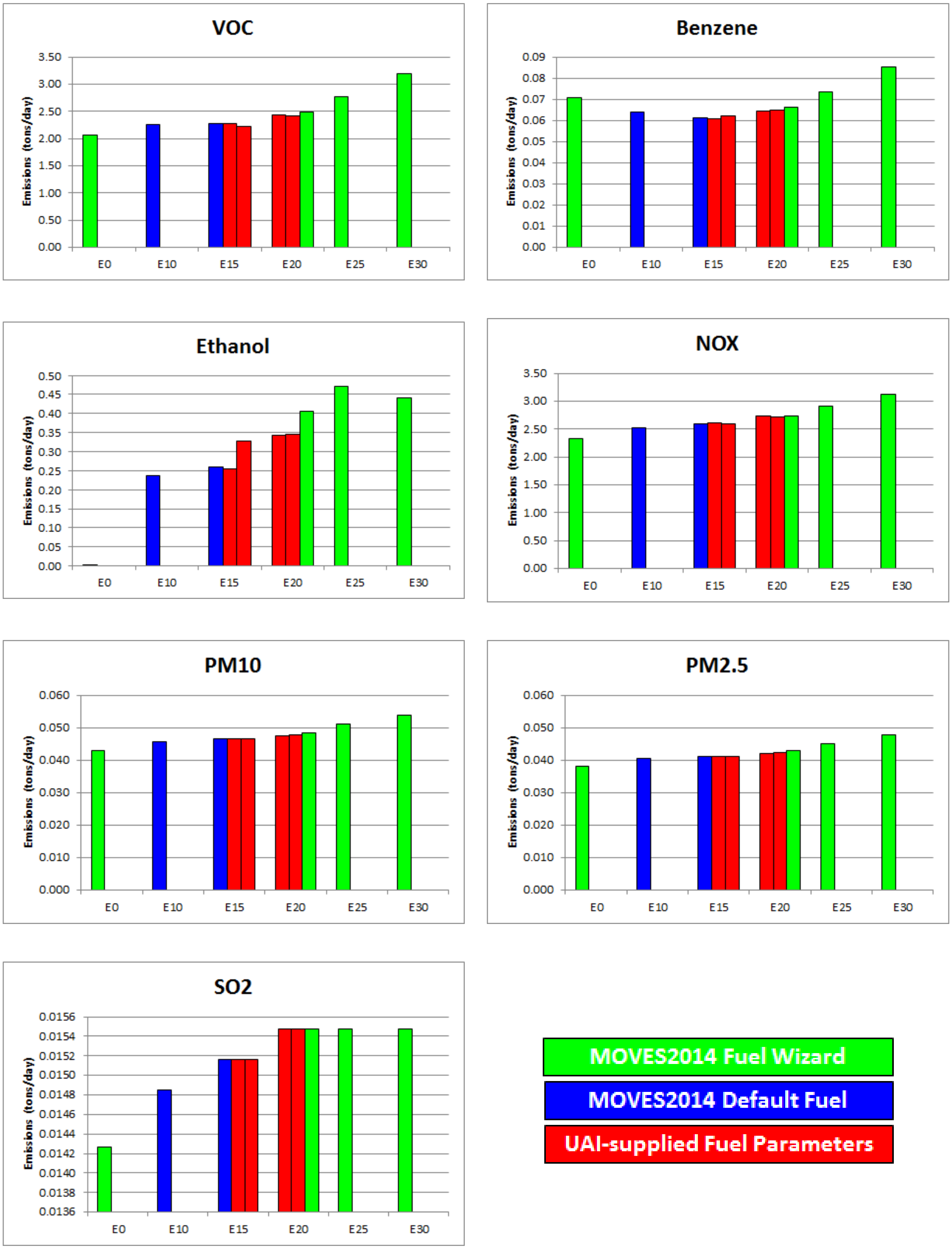

Figure 3. Bar charts of total (exhaust plus evaporative) emissions estimates for Kansas City (Wyandotte County), Kansas for a June weekday in 2017.

24. Figure 4 presents bar charts of MOVES2014 on-road mobile source exhaust emissions estimates for each pollutant for Chicago (Cook County), Illinois for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed for the exhaust emissions estimates with increasing fuel content (i.e., moving from E0 to E10 to E15 through E30):

   a. VOC, NOX, PM10, PM2.5 and SO2 emissions trend up from E0 to E30 fuels;

   b. Benzene emissions trend down from E0 to E15 fuels and trend up from E20 to E30 fuels; and

   c. Ethanol emissions trend up from E0 to E20 fuels and trend down from E25 to E30 fuels.

25. Figure 5 presents bar charts of MOVES2014 on-road mobile source evaporative emissions estimates for each pollutant for Chicago (Cook County), Illinois for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed for the evaporative emissions estimates with increasing fuel content:

   a. VOC emissions trend up from E0 to E30 fuels;

   b. Benzene emissions trend up from E0 to E20 fuels and trend down from E25 to E30 fuels; and

   c. Ethanol emissions trend up from E0 to E30 fuels.

26. Figure 6 presents bar charts of MOVES2014 on-road mobile source total (i.e., exhaust plus evaporative) emissions estimates for Chicago (Cook County), Illinois for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed for the total (exhaust plus evaporative) emissions estimates with increasing fuel content:

   a. VOC, ethanol, NOX, PM10, PM2.5 and SO2 emissions trend up from E0 to E30 fuels; and

   b. Benzene emissions trend down from E0 to E15 fuels and trend up from E20 to E30 fuels.

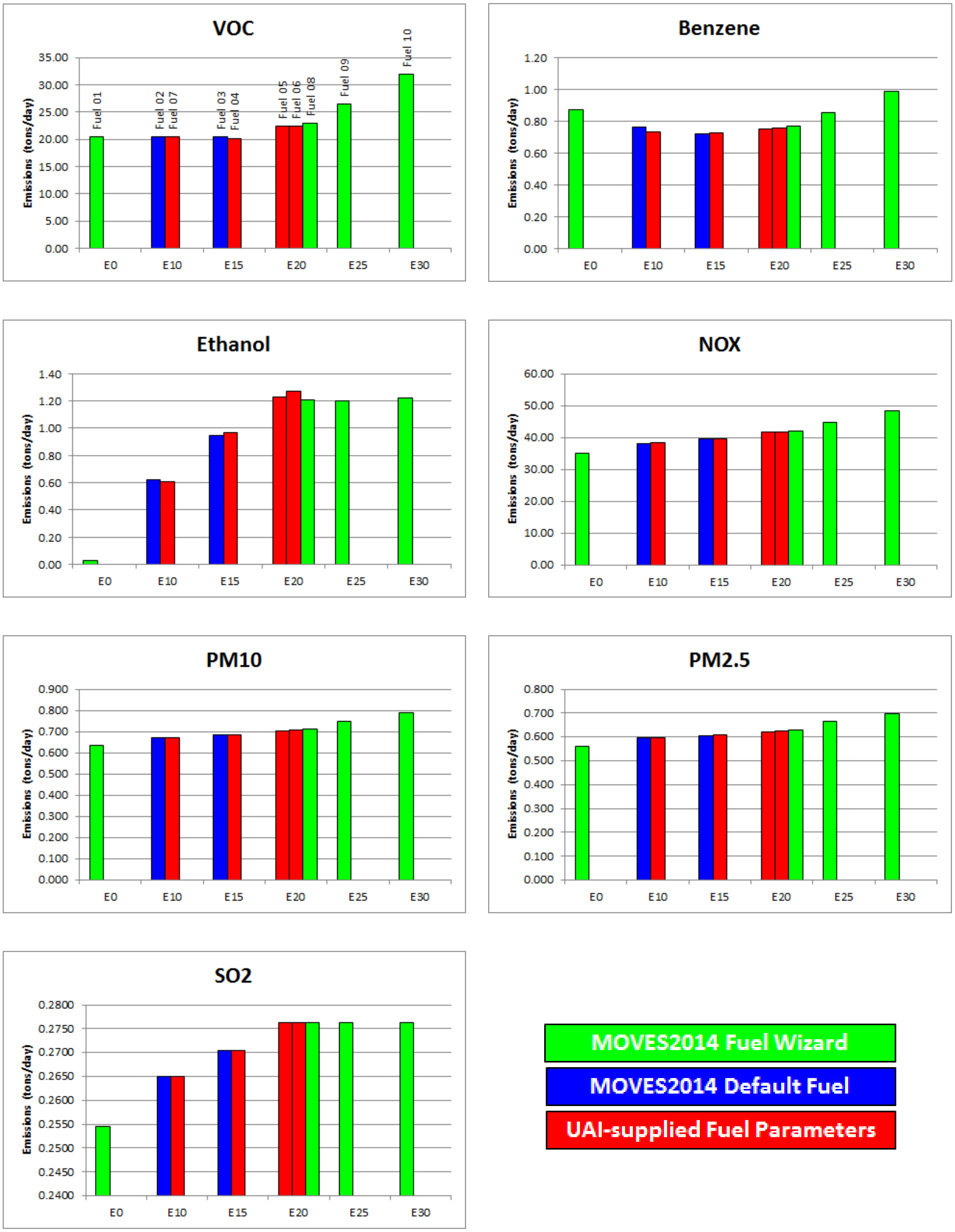

Figure 4. Bar charts of exhaust emissions estimates for Chicago (Cook County), Illinois for a June weekday in 2017.

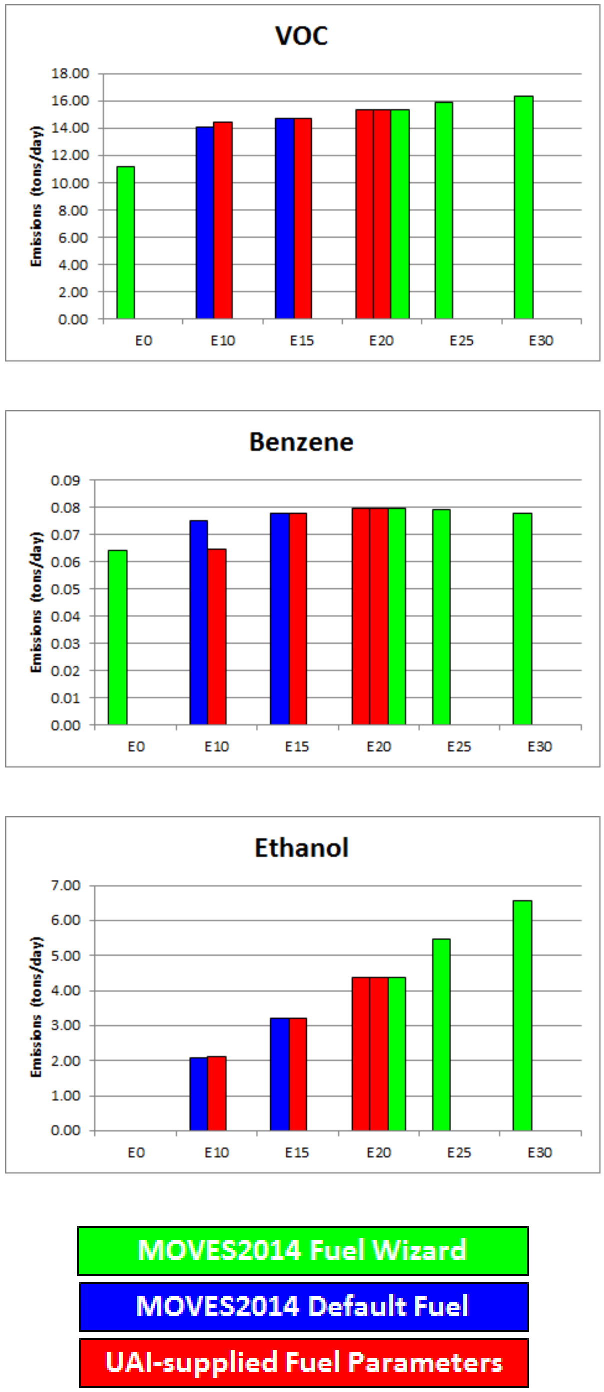

Figure 5. Bar charts of evaporative emissions estimates for Chicago (Cook County), Illinois for a June weekday in 2017.

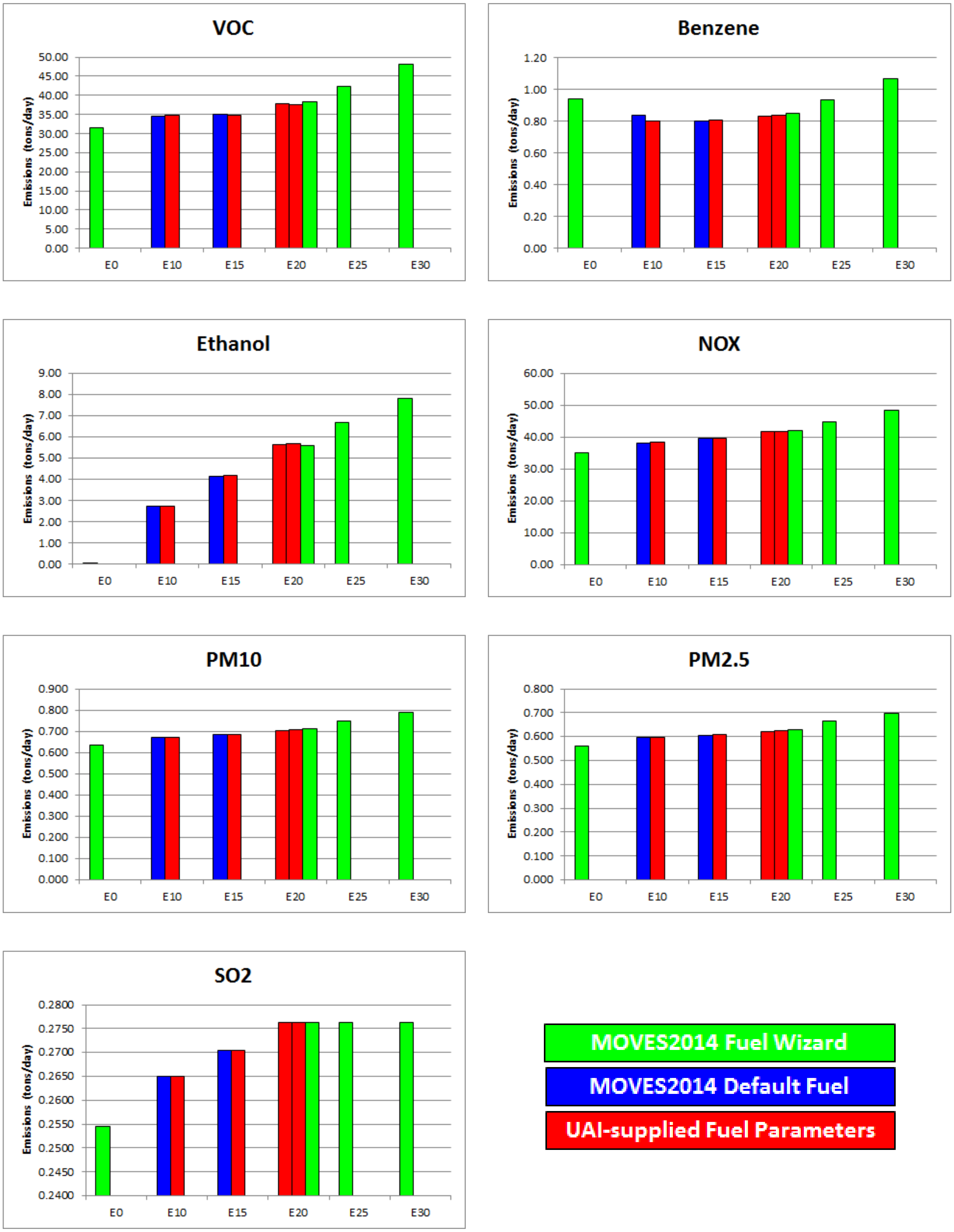

Figure 6. Bar charts of total (exhaust plus evaporative) emissions estimates for Chicago (Cook County), Illinois for a June weekday in 2017.

27. Figure 7 presents bar charts of MOVES2014 on-road mobile source exhaust emissions estimates for each pollutant for Minneapolis (Hennepin County), Minnesota for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed for the exhaust emissions estimates with increasing fuel content (i.e., moving from E0 to E10 to E15 through E30):

    a. VOC, NOX, PM10, PM2.5 and SO2 emissions trend up from E0 to E30 fuels;

    b. Benzene emissions trend down from E0 to E15 fuels and trend up from E20 to E30 fuels; and

    c. Ethanol emissions trend up from E0 to E20 fuels and trend down from E25 to E30 fuels.

28. Figure 8 presents bar charts of MOVES2014 on-road mobile source evaporative emissions estimates for each pollutant for Minneapolis (Hennepin County), Minnesota for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed for the evaporative emissions estimates with increasing fuel content:

    a. VOC emissions trend up from E0 to E30 fuels;

    b. Benzene emissions trend up from E0 to E15 fuels and trend down from E20 to E30 fuels; and

    c. Ethanol emissions trend up from E0 to E30 fuels with increasing ethanol content.

29. Figure 9 presents bar charts of MOVES2014 on-road mobile source total (i.e., exhaust plus evaporative) emissions estimates for Minneapolis (Hennepin County), Minnesota for a June weekday in 2017 grouped by the ethanol content of the fuels. In general, the following is observed for the total (exhaust plus evaporative) emissions estimates with increasing fuel content:

    a. VOC, ethanol, NOX, PM10, PM2.5 and SO2 emissions trend up from E0 to E30 fuels; and

    b. Benzene emissions trend down from E0 to E15 fuels and trend up from E20 to E30 fuels.

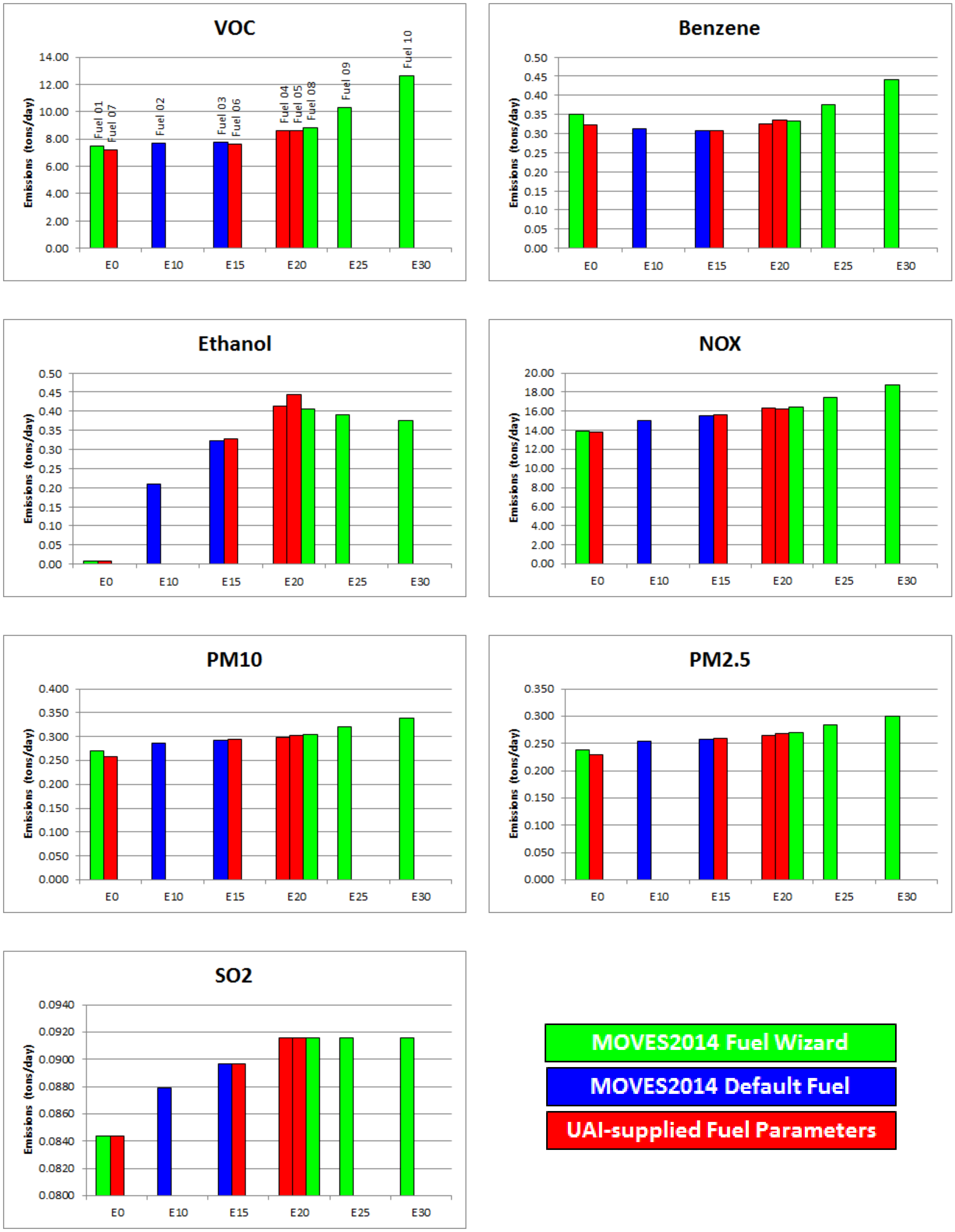

Figure 7. Bar charts of exhaust emissions estimates for Minneapolis (Hennepin County), Minnesota for a June weekday in 2017.

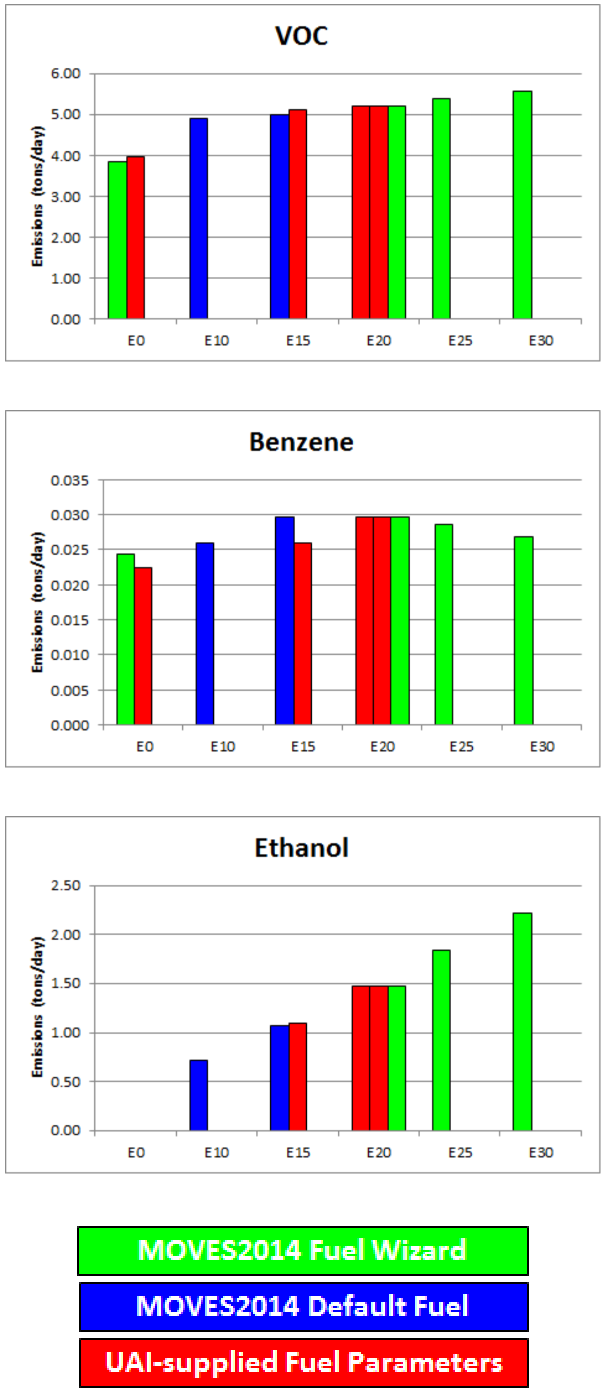

Figure 8. Bar charts of evaporative emissions estimates for Minneapolis (Hennepin County), Minnesota for a June weekday in 2017.

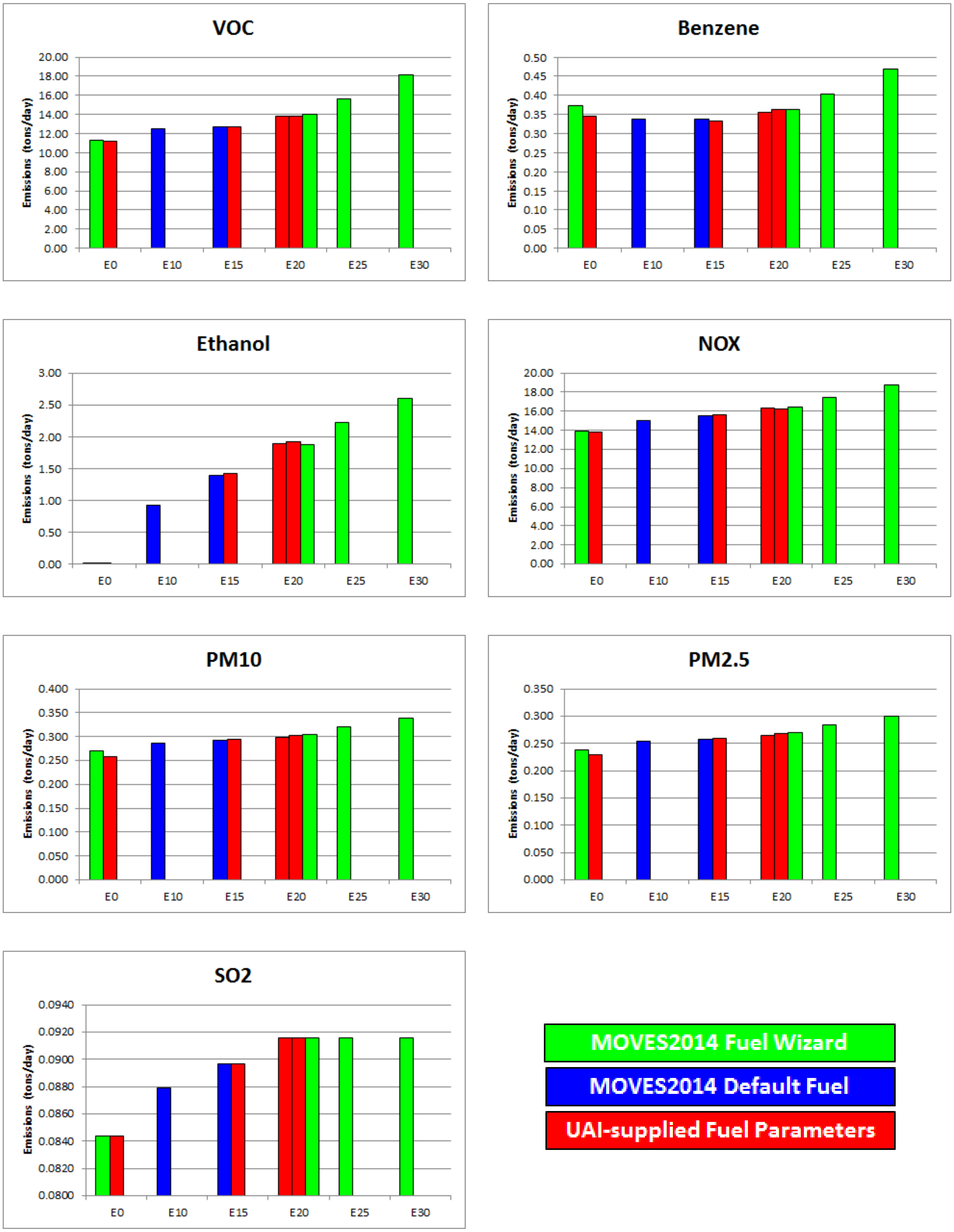

Figure 9. Bar charts of total (exhaust plus evaporative) emissions estimates for Minneapolis (Hennepin County), Minnesota for a June weekday in 2017.

Conclusion

30. MOVES2014 was used to estimate on-road mobile source emissions for a June 2017 weekday and weekend day for Kansas City (Wyandotte County), Kansas, Chicago (Cook County), Illinois, and Minneapolis, (Hennepin County), Minnesota for the following fuel formulation parameter data sets:

    a. Each county-specific MOVES2014 default fuel (i.e., two per county);

    b. Four different fuel formulation parameter data sets for each county based on data provided by UAI; and

    c. Four different fuel formulation parameter data sets for each county derived from the MOVES2014 Fuels Wizard.

31. The fuels that were modelled had ethanol contents of 0% (E0), 10% (E10), 15% (E15), 20% (E20), 25% (E25), and 30% (E30) by volume.

32. In general, the following is observed in regards to exhaust emissions estimated by MOVES2014 across all fuels and counties that were modelled with increasing ethanol content:

    a. VOC, NOX, PM10, PM2.5 and SO2 emissions estimates trend up from E0 to E30 fuels;

    b. Benzene emissions estimates trend down from E0 to E15 fuels and trend up from E20 to E30 fuels; and

    c. Ethanol emissions estimates trend up from E0 to E20 fuels and trend down from E25 to E30 fuels.

33. In general, the following is observed in regards to evaporative emissions estimated by MOVES2014 across all fuels and counties that were modelled with increasing ethanol content:

    a. VOC emissions estimates trend up from E0 to E30 fuels;

    b. Benzene emissions estimates trend up from E0 to E20 fuels and trend down from E25 to E30 fuels; and

    c. Ethanol emissions estimates trend up from E0 to E30 fuels.

34. In general, the following is observed in regards to total (i.e., exhaust plus evaporative) VOC, benzene, and ethanol emissions estimated by MOVES2014 across all fuels and counties that were modelled with increasing ethanol content:

    a. VOC emissions estimates trend up from E0 to E30 fuels;

    b. Benzene emissions estimates trend down from E0 to E15 fuels and trend up from E20 to E30 fuels; and

    c. Ethanol emissions estimates trend up from E0 to E30 fuels.

35. Weekday and weekend day emissions estimated by MOVES2014 exhibit similar trends though weekend day emissions estimates are general lower by 10% to 30% depending on pollutant.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June ___, 2015.

[Signature]
James G. Wilkinson

1. My initial declaration in this case reported the emissions estimated by EPA's MOVES2014 model (MOVES2014 October 2014 Release) for fuels with varying blends of ethanol.

2. After I submitted my initial declaration, EPA announced the publication of a revision to MOVES2014, known as MOVES2014a.[1] EPA reported that in the revised model, "[t]he change in brake wear emissions results in small decreases in PM emissions, while emissions for other criteria pollutants remain essentially the same as MOVES2014."[2]

3. The Urban Air Initiative (UAI) desired to understand how MOVES2014a compares with MOVES2014. UAI contracted with me to compare the default fuel parameters of MOVES2014 and MOVES2014a and to compare the emissions estimates of the two models.

4. I extracted the default fuel parameters for the years 2014 and 2017 from each version of the models' fuel characteristics database (i.e., the data table *fuelformulation*) using a structured query language (SQL) script and compared the resulting data sets.

5. I determined that the default fuel parameters for 2014 are identical in both versions of the model for Kansas City (Wyandotte County), Chicago (Cook County), Minneapolis (Hennepin County), and other United States counties.

6. I determined that the default fuel parameters for 2017 are identical in both versions of the model for Kansas City (Wyandotte County), Chicago (Cook County), Minneapolis (Hennepin County), and most other United States counties.[3]

7. Using MOVES2014a, I replicated the same model runs that I performed with MOVES2014 for my initial declaration, using the same inputs, location (Kansas City) and year (2017). In my previous declaration I stated that I also ran MOVES2014 for Chicago and Minneapolis. I have assumed that any differences shown between the model runs for Kansas City will also manifest themselves in subsequent runs for Chicago and Minneapolis.

8. The resulting emissions estimates using MOVES2014a for Kansas City were essentially identically for the chemical species benzene, ethanol, PM_{10}, $PM_{2.5}$, and SO_2; however, there are consistent, small decreases in the VOC (about 0.1%) and NO_X (about 0.3%) emissions estimates in the MOVES2014a runs when compared to the MOVES2014 runs, across all ethanol-blended fuels that were modeled. Regardless of this small, consistent decrease in VOC and NOx emissions estimates in the current MOVES2014a model runs as compared to the

[1] EPA Releases MOVES2014a Mobile Source Emissions Model: Questions and Answers (Nov. 2015), http://www3.epa.gov/otaq/models/moves/documents/420f15046.pdf.

[2] *Id.* at 1.

[3] There are differences between each model's 2017 default fuel parameters for Arizona's Maricopa County and all California counties. In the MOVES2014 default fuel parameters data base, Arizona's Maricopa County and all California counties are listed as using an E15 fuel in 2017, but in the MOVES2014a default fuel parameters data base, the same counties are listed as using an E10 fuel in 2017. What is further perplexing in this situation is that the fuel parameters for RVP, sulfur content, aromatic content, olefin content, benzene content, E200, E300, T50 and T90 are identical between the two versions of the model for these counties.

MOVES2014 model runs, the conclusions reached in my first declaration are still the same and are repeated as follows:

a. In general, the following is observed in regards to exhaust emissions estimated by MOVES2014a across all fuels for Kansas City (Wyandotte County) that were modelled with increasing ethanol content:

   i. VOC, NO_X, PM_{10}, $PM_{2.5}$ and SO_2 emissions estimates trend up from E0 to E30 fuels;
   ii. Benzene emissions estimates trend down from E0 to E15 fuels and trend up from E20 to E30 fuels; and
   iii. Ethanol emissions estimates trend up from E0 to E20 fuels and trend down from E25 to E30 fuels.

b. In general, the following is observed in regards to evaporative emissions estimated by MOVES2014a across all fuels for Kansas City (Wyandotte County) that were modelled with increasing ethanol content:

   i. VOC emissions estimates trend up from E0 to E30 fuels;
   ii. Benzene emissions estimates trend up from E0 to E20 fuels and trend down from E25 to E30 fuels; and
   iii. Ethanol emissions estimates trend up from E0 to E30 fuels.

c. In general, the following is observed in regards to total (i.e., exhaust plus evaporative) VOC, benzene, and ethanol emissions estimated by MOVES2014a across all fuels for Kansas City (Wyandotte County) that were modelled with increasing ethanol content:

   i. VOC emissions estimates trend up from E0 to E30 fuels;
   ii. Benzene emissions estimates trend down from E0 to E15 fuels and trend up from E20 to E30 fuels; and
   iii. Ethanol emissions estimates trend up from E0 to E30 fuels.

d. Weekday and weekend day emissions estimated by MOVES2014a exhibit similar trends though weekend day emissions estimates are generally lower by 10% to 30% depending on the pollutant.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 2, 2016

James G Wilkinson
James G. Wilkinson