Well-to-Wheels Analysis of Zero-Emission Plug-In Battery Electric Vehicle Technology for Medium- and Heavy-Duty Trucks

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This supporting information has 6 pages, 3 tables, and 3 figures.

Table S1 shows the weighing factors of non-idle and idle cycles.

Table S1: Weighting factors for duty cycles [1]

	Distance-weighted (%)			Time-weighted (%)			Average speed during non-idle cycles (mi/hr)
	ARB Transient	EPA 55 mph	EPA 65 mph	Drive idle	Parked idle	Non-idle	
Day Cabs (Short-haul)	19	17	64	0	0	100	1
Sleeper Cabs (Long-haul)	5	9	86	0	0	100	1
Vocational - Regional	20	24	56	0	25	75	38.41
Vocational - Multi-Purpose (Class 2b-7)	54	29	17	17	25	58	23.18
Vocational - Multi-Purpose (Class 8)	54	23	23	17	25	58	23.27
Vocational - Urban (Class 2b-7)	92	8	0	15	25	60	16.25
Vocational - Urban (Class 8)	90	10	0	15	25	60	16.51

Table S2 and S3 list the results from Autonomie and Fleet DNA models.

Table S2: Diesel Trucks Fuel Consumption for various cycles

Class	**Type**	**Payload (kg)**	**Test mass (kg)**	**Battery size (kWh)**	**Non-Idle Fuel Rate (DGE/mile)**			**Idle Fuel Rate [2] (DGE/hr)**
					ARB cycle	55 MPH cycle	65 MPH cycle	
8	Long-haul combination	17329	30454	2.4	0.208	0.129	0.146	0.6
	Short-haul combination	17324	29371	2.4	0.204	0.134	0.154	0.63
	Refuse	12400	24522	3.2	0.189	0.124	0.146	0.81
6	Medium heavy-duty vocational	5146	11324	3.2	0.110	0.092	0.113	0.73
4	Light heavy-duty vocational	2755	6839	3.2	0.081	0.066	0.081	0.73
2	Pick-up Trucks and Vans	608	3761	3.2	0.061	0.051	0.063	0.36

Table S3: Battery Electric Trucks Fuel Consumption for various cycles

Class	Type	Payload (kg)	Test mass (kg)	Battery size (kWh)	Non-Idle Fuel Rate (DGE/mile)			Idle Fuel Rate (DGE/hr)
					ARB cycle	55 MPH cycle	65 MPH cycle	
8	Long-haul combination	17329	36998	1572.9	0.089	0.075	0.087	0.045
	Short-haul combination	17324	32075	834.2	0.080	0.075	0.087	0.045
	Refuse	12400	26071	434.9	0.055	0.063	0.073	0.045
6	Medium heavy-duty vocational	5146	11464	326.2	0.028	0.042	0.053	0.0748
4	Light heavy-duty vocational	2755	6620	219.0	0.018	0.027	0.033	0.0748
2	Pick-up Trucks and Vans	608	3840	230.7	0.013	0.021	0.026	0.0258

Figure S1 depicts how the U.S. and regional electricity mixes evolve from 2019 to 2030. Figure S2 and S3 show the regional electricity mix emission intensities for year 2019 and 2030, respectively.

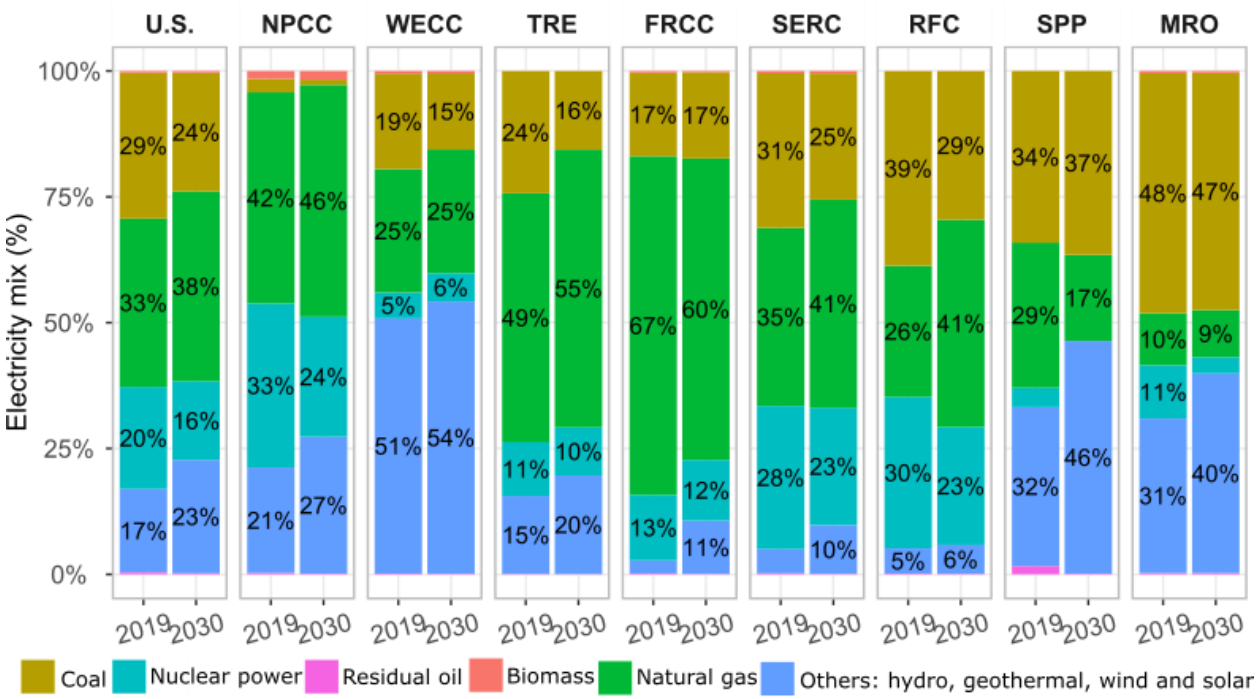

Figure S1: U.S. and regional electricity mix for 2019 and 2030 [3]

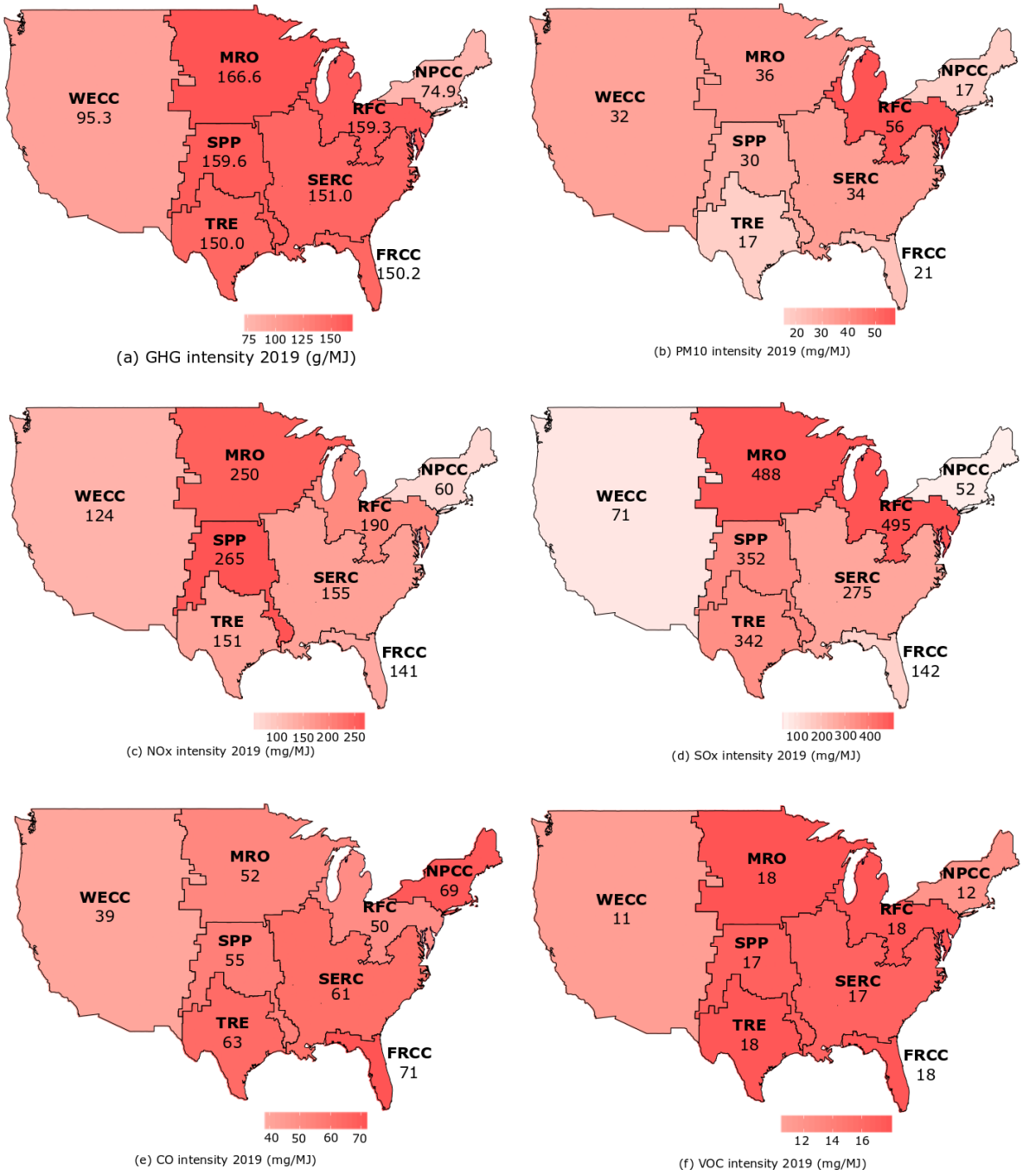

Figure S2: 2019 regional electricity mix emission intensities [3]

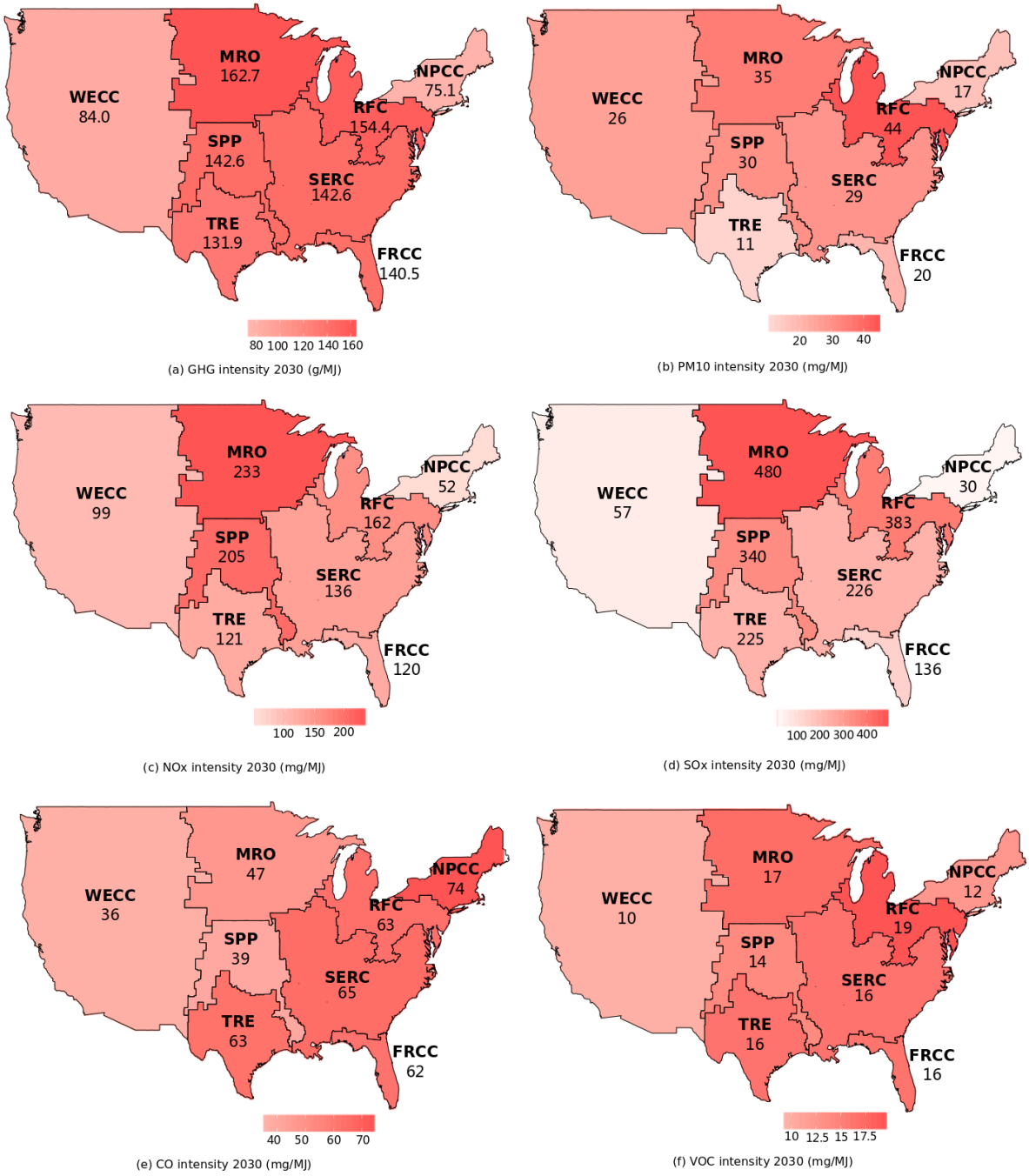

Figure S3: 2030 regional electricity mix emission intensities [3]

Reference

(1) United States Environmental Protection Agency. Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles— Phase 2. 2016, pp 73478–74274.

(2) National Renewable Energy Laboratory. Fleet DNA: Commercial Fleet Vehicle Operating Data https://www.nrel.gov/transportation/fleettest-fleet-dna.html (accessed Nov 22, 2019).

(3) Energy Systems. Argonne National Laboratory. The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model https://greet.es.anl.gov/ (accessed Apr 16, 2019).