

July 18, 2022

Advanced Clean Fleets  
California Air Resources Board  
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**Subject: Comments – May 2, 2022 Version of the “Advanced Clean Fleets Regulation Proposed Draft Regulation Language – High Priority and Federal Fleet Requirements”**

Dear California Air Resources Board:

On behalf of the California Cement Manufacturers Environmental Coalition (CCMEC), we would like to thank the California Air Resources Board (CARB) and its staff for the opportunity to comment on the Advanced Clean Fleets (ACF) draft language for high priority fleets issued in May 2022. California’s cement industry has a long and successful record of collaborating with the CARB in developing regulations that work to achieve the state’s goals of carbon reduction, while allowing the industry to continue to produce some of the cleanest cement in the world. After reviewing the May 2022 draft, the CCMEC has identified areas of concern. Specifically, the ACF rule language, in our opinion, does not adequately address Zero Emission Vehicle (ZEV) feasibility issues as discussed in earlier publications written by CARB staff, including ZEV studies and survey reports.

### **ALIGNMENT OF THE ACF RULE AND ACT RULE APPENDIX E AND LER SURVEY SUMMARY**

An area of concern for the CCMEC is ZEV feasibility in various truck applications. The CARB provided a detailed study (ZEV market analysis provided in Appendix E of the ACT ISOR) and a data summary (Large Entity Reporting [LER] survey summary) on feasibility issues, however, in our analysis it doesn’t appear that this data is reflected in the most recent draft of the ACF rule. In this section, CCMEC has compared the draft ACF rule language to the ACT rule Appendix E and to the LER results. The overall conclusions are:

The draft ACF rule language is not consistent with the Appendix E and LER results. If the CARB staff is relying on this information in the ACF rulemaking we would like to have a more detailed discussion on how staff integrated this into the most recent draft. In our review, the ZEV is not feasible for many work truck types currently assigned to Group 2. The CCMEC would recommend the truck assignments to the groups and the exemption language both be modified (see below).

The CCMEC would ask that the issue of truck range limitations be recognized in the draft ACF rule, and truck range data (beyond just the truck type) needs to be correctly reflected in the group

assignments. Additionally, conforming revisions should address the ZEV unavailability and daily mileage exemptions.

In our opinion, the ACF rule should be structured to encourage large manufacturing runs for each truck type, to achieve economies of scale and reduce manufacturing costs.

General note about LER data: For transparency in understanding the data, it would be helpful to the CCMEC and other stakeholders if the CARB released truck range data by truck type and by industry. See **attached** instructions for range data format requested, based on required entries in LER survey.

## **PROPOSED CHANGES TO ZEV AVAILABILITY CRITERIA AND CORRESPONDING BENEFITS**

In the CCMEC's opinion the ZEV unavailability exemption needs to be upgraded. The following principles should be applied to assessing ZEV availability criteria:

- The CARB should verify and certify that a ZEV option is available (and hence the facility does not qualify for an exemption); responsibility for verifying availability or lack of availability should not be placed on individual facilities.
- The CCMEC believes there must be at least two viable manufacturers with trucks available for the application (including meeting the range requirements for the specific application), complying with all of the following items.
  - To be considered available under the ACF rule, ZEV trucks must meet specified performance standards, including truck range, efficiency, and charging/fueling time. (This is similar to the VDECS certification approach used in the CARB diesel rules.)
  - Trucks must have completed a 6-month demonstration program (involving approximately ten trucks per vendor) based on a commercial truck model (not a "demo truck" which may not be truly representative of the commercial model), in which truck range, efficiency, and charging/fueling time data are collected (for ZEV and diesel trucks side-by-side) and published for multiple competing vendors.
  - To be considered available under the ACF rule, trucks manufacturers must provide warranties that trucks will meet the performance standards over time.
- The effect of the performance standards and demonstration programs will be to provide confidence to buyers to purchase trucks in a timely manner, resulting in larger manufacturing runs by truck type (typically 50-100 or more trucks at one time), thereby reducing manufacturing costs due to economies of scale.

## **ADDITIONAL THOUGHTS ON ACT APPENDIX E, LER, AND CONSEQUENCES FOR ACF RULE LANGUAGE**

The CARB's own publications show that there are real and valid feasibility issues for ZEV in industrial applications. The **attached** table presents summary data and excerpts from the ACT ISOR Appendix E, illustrating the high suitability scores (poor feasibility), and also excerpts from the LER report, showing the large percentage of trucks with ranges over 150 miles per day (over 50% of tractor day cabs and 10% of other trucks – see **attached** for request for CARB to release disaggregated version of other truck data):

- In our review, it appears there are many trucks assigned to Group 2 that have high suitability scores (poor feasibility) in ACT ISOR Appendix E. Trucks with high suitability scores should be moved to Group 3.
- The group assignments and daily mileage exemption, in the CCMEC's opinion, do not adequately address truck range. If the truck range is limited, there would be a need to purchase more trucks and hire more staff to account for the fewer trips per day for one truck. This would be an extremely expensive compliance requirement (and very difficult to implement in the current job market). Therefore, the group assignments and the exemption language would both need to be modified.
  - Work trucks with daily mileage greater than 150 miles per day should be assigned to Group 3.
  - The exemption language should indicate that the trucks available need to be able to complete the same functions as the trucks being replaced with no more than one charging (interruption) per worker shift, and be based on charging on company property only, not based on public charging. The ZEV should be designated unavailable if it cannot meet the performance as outlined above for the truck it would be replacing.
  - If there is a need to switch to FCEV to get adequate range for a given application, there should be additional time provided in the ACF rule schedule for truck purchases (see below for proposed rule language change for H2 technology).

## **SPECIFIC CHANGES TO GROUP ASSIGNMENTS AND EXEMPTION LANGUAGE BASED ON EARLIER DATA**

### ***ZEV Unavailability Exemption in Advanced Clean Fleet (ACF) Rule***

The certification of availability should be managed by the CARB to prove ZEV truck availability in non-standard applications, based on the criteria as listed above. The ZEV unavailability exemption should be modified to clarify what ZEV availability means, for example, to require that at least two vendors be available and that the ZEV meet performance standards, as well as other wording changes as noted above. These changes will avoid a scenario where a single vendor with a substandard offering can force a purchase, by interfering with a facility's ability to earn an exemption.

### ***ZEV Daily Mileage Exemption***

The current version of the ZEV daily mileage exemption is conditioned upon unavailability of charging/fueling stations along the daily routes. The CCMEC would prefer the exemption language be amended to state that trucks must be able to complete an entire worker shift with only one charging event (which can be at the end of the shift).

### ***Incorporation of Truck Manufacturer Commitments in Truck Grouping and Fleet Extensions***

One of the main factors affecting ZE truck pricing in California is the fact that the California ZEV rule is very far ahead of the rest of the U.S. (and the world). The California ZEV market is too small (for certain truck types) to support the large manufacturing runs that will make ZE trucks cost effective. If a large manufacturing run cannot be justified and prices remain high, then an extension should be provided.

Concrete mixers: The assignment of concrete mixers to Group 3 (as shown in the LER report) should be specifically included in the rule itself.

Trucks with PTO: Trucks with Power Take Off (PTO) should be identified separately in the rule and these trucks should be assigned to Group 3.

Day cab tractors: Tractor assignment to Group 2 or Group 3 needs to be based on historical truck range data, not on the non-technical naming of the truck type i.e. “day cab” and “sleeper cab”.

## **ADDITIONAL, BROADER ACF RULE CHANGES REQUESTED**

### ***Elimination of NZEV Requirements in ZEV Unavailability Exemption***

There is a difference between offering NZEV as a flexibility measure in the ACT rule and mandating consideration of NZEV prior to securing an exemption from the ACF rule. The inclusion of NZEV consideration prior to securing an exemption is problematic, because the emission minimal reductions are not justified in light of the high cost burden and should be eliminated. NZEV purchases require that facilities replace their trucks twice in 10 years since, ultimately, facilities will need to replace NZEV with ZEV starting in 2035.

### ***Infrastructure Readiness for Battery Electric as a Condition for Rule Milestones***

Prior to passage of the ACF rule, the CEC/CPUC should complete an infrastructure readiness evaluation specific to the ACF rule provisions (the existing readiness evaluation barely touches on HD trucks, and do not address the ACF rule specifics). The rule milestones need to be made contingent on infrastructure readiness **achieved** (which fleet managers have little or no control over), namely on a CEC/CPUC study to be completed every 2 years, at least 1 year prior to the next fleet milestone (e.g., Groups 1, 2, and 3).

### ***H<sub>2</sub> Technology Investment Extension***

For facilities choosing to commit to hydrogen (H<sub>2</sub>) truck purchases for a certain fleet percentage and placing a non-refundable deposit into CARB-specified accounts owned by the facility (similar to draft locomotive rule and other CARB mobile source rules) at the time of the rule deadline for a specific fleet percentage, an extension of several years should be provided to the ZEV percentage deadlines shown in the ACF rule for delivery and operation of H<sub>2</sub> trucks. Hence, the three compliance options are: ZEV, exemption/extension (under modified existing language), or funds commitment for delivery of H<sub>2</sub> trucks several years later (proposed new option). The H<sub>2</sub> schedule is contingent on H<sub>2</sub> fuel price subsidies noted below.

### ***Infrastructure Public Investment Extension***

There must be public (government) investment in infrastructure for battery electric and fuel cell vehicle charging, as well as CARB guarantees on electricity rate and Low Carbon Fuel Standard (LCFS) credit values.

### ***Green H<sub>2</sub> Price Subsidy***

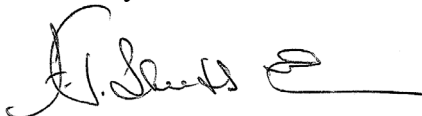
There must be public (government) subsidies for green H<sub>2</sub> fuel price, to make it comparable to a specified diesel price (using an official diesel comparison price based on historical data).

## **CONCLUSION**

The CCMEC believes significant rule revisions are needed and additional studies or analysis should be completed by the CARB and other state agencies, including further studies of infrastructure readiness, before the ACF rule can be implemented.

The CCMEC would welcome the opportunity to discuss our concerns further, and better understand the draft rule in print. Please advise us of the appropriate CARB personnel we can contact to further discuss our concerns. Should you have any questions or concerns, please contact me at your convenience.

Sincerely,



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Attachment: Summary Table, Data Request to CARB, Excerpts from ACT ISOR Appendix E and Excerpts from Large Entity Reporting (ACT Survey) Document

Suitability Score Summary Table excerpted from Advanced Clean Trucks Initial Statement of Reasons, Appendix E [DRAFT Revisions to Group Assignments]

#	App E Tbl Index #	BEV Suitability Score	FC Suitability Score	ACF Truck Group Assigned	ACF Truck Group MODIFIED	Market Segment	Weight Class	Annual CA Sales	BEV Routes/Range Score	FC Routes/Range Score	Outlier
1	40	6	3.75	2	3	Pickup Truck - Towing	2B-3	3000	Variable - expect several will have long distance (~500 mile) routes. Towing will significantly shorten available EV range. (Value=3)	Variable - expect several will have long distance (~500 mile) routes. Towing will significantly shorten available EV range. (Value=1)	-
2	41	5.5	5.5	2	2	Pickup Truck 4WD Off Road	2B-3	5000	Variable-expect some will have long distance routes. (Value=1)	Variable-expect some will have long distance routes. (Value=1)	-
3	42	5.5	3.75	2	2	Pickup Truck PTO Equipped	2B-3	1500	Assume set routes, <100 miles per day, may have extended idling. (Value=1)	Assume set routes, <100 miles per day, may have extended idling. (Value=1)	-
4	87	1.5	1.5	1	1	H-D Van Passenger	2B-3	6198	Variable (Value=1)	Variable (Value=1)	-
5	22	6	3.75	1	2	Box Truck & Delivery (Medium to Heavy Load >200 Miles perDay)	4-7	1538	Variable >200 miles per day (Value=10)	Variable >200 miles per day (Value=1)	-
6	30	1	1	2	1	Flatbed Stake/Platform	4-7	370	Variable (Value=1)	Variable (Value=1)	Outlier
7	35	8.25	6	2	3	Regional Tractor - Long Haul, Day Cab	4-7	100	Variable, >200 miles per day (Value=10)	Variable, >200 miles per day (Value=1)	-
8	61	3.75	3.75	2	2	Utility Service - Private (Class 6-7)	4-7	143	Variable (Value=1)	Variable (Value=1)	-
9	36	8.25	6	3	3	Regional Tractor- Long Haul, Sleeper Cab	8	300	Variable, 200-500+ miles per day (Value=10)	Variable, 200-500+ miles per day (Value=1)	-
10	46	7.75	5.5	3	3	Concrete Mixer	8	70	Highly variable (Value=10)	Highly variable (Value=1)	-
11	49	4.75	2.5	2	2	Mining Service	8	15	Variable (Value=10)	Variable (Value=1)	Outlier
12	73	6	3.75	2	3	Construction Dump	8	342	Highly variable, but typically 150250 miles per day (Value=10)	Highly variable, but typically 150250 miles per day (Value=1)	-

Data from ACT ISOR Appendix E: <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/appe.pdf>

Data request to CARB for Large Entity Reporting data breakdown, July 14, 2022:

Please provide a breakdown similar to Question #18 for the daily mileage for “Other trucks”, as shown in the Question #18 table (percent of trucks in each daily mileage range) for the following trucks, organized by NAICS code, and specifically for NAICS code 327320, summed for all facilities in that NAICS code.

- Concrete mixer
- Tractor day cab
- Dump
- Service Body
- Other

Also, please provide a summary by industry (i.e., group of similar NAICS codes) of percent of trucks in each daily mileage range

# Large Entity Fleet Reporting

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STATEWIDE AGGREGATED DATA

California Air Resources Board



## Vehicle Information

This section is about the vehicles associated with each home base facility and how they are used. All on-road vehicles with a GVWR >8,500 lbs. and off-road yard trucks regardless of fuel type or use were included in this section. Vehicles were grouped by body type, fuel type, and weight class bin for each home base location.

### 15. What is the body type for each vehicle reported?

The following data has been split into two tables to separate public fleet data from fleets that could be subject to the proposed ACF regulation high priority and federal fleet requirement. The data is categorized by Group 1, Group 2, and Group 3 for body type, consistent with the proposed ACF regulation for high priority and federal fleets (as of 9/16/2021).

Body Type (excluding public fleets)	Number of Owned Vehicles	Number of Dispatched Vehicles	Did Not Specify	Total Vehicle Count	Percent Total Vehicles
Beverage Truck	210	0	0	210	0.07%
Box Reefer	6,981	406	100	7,487	3%
Box Dry Van	14,329	8,574	123	23,026	8%
Bus-Shuttle	1,065	138	98	1,301	0.43%
Bus-Other	345	66	0	411	0.14%
On-Road Yard Tractor	522	20	37	579	0.19%
Off-Road Yard Tractor	3,497	126	276	3,899	1%
Van-Cargo	10,770	27	28	10,825	4%
Van-Step	2,752	0	47	2,799	1%
Van-Passenger	2,040	11	9	2,060	1%
ACF Group 1 Subtotal	42,511	9,368	718	52,597	18%
Boom/Bucket	4,926	8	11	4,945	2%
Dump	4,664	2,959	9	7,632	3%
Flatbed or Stake Bed	11,174	310	55	11,539	4%
Garbage Front Loader	992	0	2	994	0.33%
Garbage Packer	3,706	0	0	3,706	1%
Garbage Roll-Off	1,747	0	2	1,749	1%
Garbage Side Loader	1,911	0	0	1,911	1%
Pickup Bed	15,614	180	212	16,006	5%

Body Type (excluding public fleets)	Number of Owned Vehicles	Number of Dispatched Vehicles	Did Not Specify	Total Vehicle Count	Percent Total Vehicles
Service Body	16,698	131	121	16,950	6%
Sweeper	288	1	2	291	0.10%
Tank	2,399	0	10	2,409	1%
Tractor Day Cab	32,551	70,852	264	103,667	35%
Tow	93	23	6	122	0%
Water	1,730	0	4	1,734	1%
ACF Group 2 Subtotal	98,493	74,464	698	173,655	58%
Car Carrier	483	2	0	485	0.16%
Concrete Mixer	3,070	0	0	3,070	1%
Concrete Pump	125	0	0	125	0.04%
Crane	1,308	0	3	1,311	0.44%
Drill Rig	281	2	0	283	0.09%
Tractor Sleeper Cab	27,168	12,602	80	39,850	13%
Vacuum	549	0	261	810	0.27%
ACF Group 3 Subtotal	32,984	12,606	344	45,934	15%
Other	8,049	18,385	420	26,854	9%
Invalid responses	91	0	0	91	0.03%
Total vehicles	182,128	114,823	2,180	299,131	100%

Body Type (public fleets only)	Number of Owned Vehicles	Number of Dispatched Vehicles	Did Not Specify	Total Vehicle Count	Percent Total Vehicles
Beverage Truck	6	178	89	273	0.31%
Box Reefer	195	0	66	261	0%
Box Dry Van	924	8	122	1,054	1%
Bus-Shuttle	874	20	25	919	1.05%
Bus-Other	1,975	12	50	2,037	2.34%
On-Road Yard Tractor	91	0	8	99	0.11%
Off-Road Yard Tractor	190	1	0	191	0%
Van-Cargo	3,515	2,518	1,750	7,783	9%
Van-Step	546	181	104	831	1%
Van-Passenger	2,973	1,488	967	5,428	6%

Body Type (public fleets only)	Number of Owned Vehicles	Number of Dispatched Vehicles	Did Not Specify	Total Vehicle Count	Percent Total Vehicles
ACF Group 1 Subtotal	11,289	4,406	3,181	18,876	22%
Boom/Bucket	1,593	2	43	1,638	2%
Dump	4,869	18	111	4,998	6%
Flatbed or Stake Bed	4,576	376	360	5,312	6%
Garbage Front Loader	281	0	1	282	0.32%
Garbage Packer	430	0	3	433	0%
Garbage Roll-Off	189	0	0	189	0%
Garbage Side Loader	1,523	0	0	1,523	2%
Pickup Bed	12,000	5,067	3,284	20,351	23%
Service Body	13,581	1,732	1,879	17,192	20%
Sweeper	736	3	3	742	0.85%
Tank	540	0	0	540	1%
Tractor Day Cab	1,998	34	84	2,116	2%
Tow	257	0	4	261	0%
Water	523	1	9	533	1%
ACF Group 2 Subtotal	43,096	7,233	5,781	56,110	64%
Car Carrier	41	1	0	42	0.05%
Concrete Mixer	119	0	0	119	0%
Concrete Pump	0	0	0	0	0.00%
Crane	509	0	11	520	0.60%
Drill Rig	84	0	0	84	0.10%
Tractor Sleeper Cab	296	403	0	699	1%
Vacuum	773	2	5	780	0.89%
ACF Group 3 Subtotal	1,822	406	16	2,244	3%
Other	3,348	4,314	2,263	9,925	11%
Invalid responses	0	0	0	0	0.00%
Total Vehicles	59,555	16,359	11,241	87,155	100%

**16. What fuel type is associated with each vehicle body type?**

Fuel Type	Number Tractor Day Cab	Number Sleeper Cab Tractor	Number All Other Vehicles	Percent Total Vehicles
Diesel	104,397	40,520	113,096	67%
Gasoline	214	0	104,730	27%
Natural gas	912	29	10,147	3%
Electricity	38	0	386	0.11%
Hydrogen	0	0	22	0.01%
Other	89	0	3,047	1%
Invalid responses	133	0	8,526	2%
Total vehicles	105,783	40,549	239,954	100%

**17. What is the weight class for your reported vehicles?**

Weight Class	Number Tractor Day Cab	Percent Total Day Cabs	Number Tractor Sleeper Cab	Percent Total Sleeper Cabs	Number of Other Vehicles per Weight Class	Percent Total Other Vehicles
Class 2b-3 (8,501 - 14,000lbs)	113	0%	0	0%	98,335	41%
Class 4-6 (14,001 - 26,000lbs)	1,186	1%	124	0.31%	55,374	23%
Class 7-8 (Over 26,000lbs)	104,483	99.69%	40,425	99%	76,723	32%
No response	1	0%	0	0%	9,121	4%
Invalid responses	0	0%	0	0%	401	0%
Total vehicles	105,783	100%	40,549	100%	239,954	100%

**18. What is the estimated daily mileage for each reported vehicle?**

Responses are reported to the nearest 10 percent for each mileage bin. The table provides numbers for owned vehicles, as this question did not apply to brokers that do not own the vehicles being dispatched.

Estimated Daily Mileage	Number Tractor Day Cab	Percent Total Day Cabs	Number Tractor Sleeper Cab	Percent Total Sleeper Cabs	Number of Other Vehicles per Weight Class	Percent Total Other Vehicles
Operate up to 100 miles	10,718	31%	1,322	5%	133,376	78%
101 to 150 miles	6,183	18%	832	3%	20,941	12%
151 to 200 miles	4,598	13%	1,600	6%	6,507	4%
201 to 300 miles	5,372	16%	3,887	14%	3,573	2%
Over 300 miles	7,514	22%	19,756	72%	6,681	4%
Total	34,385	100%	27,397	100%	171,078	100%

**19. Do your vehicles typically return to their home base facility on a daily basis?**

The responses are reported to the nearest 10 percent for each vehicle group for owned vehicles. It did not apply to brokers that do not own the vehicles they dispatch. The yes or no categories below were determined by multiplying the percent bin by the total number of vehicles in that category. The tables below do not include invalid responses provided for this question.

Vehicles Typically Return	Number Tractor Day Cab	Percent Total Day Cabs	Number Tractor Sleeper Cab	Percent Total Sleeper Cabs	Number All Other Vehicles	Percent Total Other Vehicles
Yes	31,371	91%	27,157	99%	102,870	57%
No	3,178	9%	307	1%	76,800	43%
Total	34,549	100%	27,464	100%	179,670	100%

**20. Do your vehicles fuel at their home base facility as a primary means of fueling?**

The responses are reported to the nearest 10 percent for each vehicle group for owned vehicles. It did not apply to brokers that do not own the vehicles they dispatch. The number of vehicles in the yes or no categories below were determined by multiplying the percent bin by the total number of vehicles in that category.

**Appendix E**  
**Zero Emission Truck Market Assessment**

## E. Advanced Clean Truck Market Segment Analysis

### 1. Battery Electric Vehicle Suitability Table

Table E-1 - Battery Electric Vehicle Suitability Table

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/Incomplete	Loading	Routes/Range	Infrastructure/Charging	Battery Space Constraints
1	3.75	<b>Beverage Tractor</b>	8	123	I	Start at max load, diminish throughout day (Value=1)	Fixed, 100 miles per day (Value=3)	Centralized, at night (Value=1)	Constrained (Value=10)
2	1.5	<b>School Bus - Class C (Longer Rural Routes)</b>	4-7	87	C or I	Light (Value=1)	125 miles per day (Value=3)	Centralized, at night and during the day (Value=1)	Open (Value=1)
3	1	<b>School Bus - Class C (Shorter Urban Routes)</b>	4-7	608	C or I	Light (Value=1)	<75 miles per day (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)
4	1	<b>School Bus - Class C (Special Needs - ADA)</b>	4-7	87	C or I	Light (Value=1)	50-150 miles per day (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/Incomplete	Loading	Routes/Range	Infrastructure/Charging	Battery Space Constraints
31	1.5	Regional Tractor - Short Haul	4-7	400	C	Variable, up to 80K GCW (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained - short wheelbase (Value=3)
32	1.5	Regional Tractor - Short Haul	8	400	C	Variable, up to 80K GCW (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained - short wheelbase (Value=3)
33	2	Regional Tractor - Medium Haul	4-7	200	C	Variable, up to 80K GCW (Value=1)	Variable, 100-300 miles per day (Value=3)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained, short wheelbase (Value=3)
34	2	Regional Tractor - Medium Haul	8	400	C	Variable, up to 80K GCW (Value=1)	Variable, 100-300 miles per day (Value=3)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained, short wheelbase (Value=3)
35	8.25	Regional Tractor - Long Haul	4-7	100	C	Variable (Value=3)	Variable, >200 miles per day (Value=10)	Future retail charging network? Multiple shift operations impact charging times (Value=10)	Constrained - short wheelbase, fairings (Value=10)



Index	Quantitative Score	Market Segment	Class	Annual CA Sales	Complete/Incomplete	Loading	Routes/Range	Infrastructure/Charging	Battery Space Constraints
36	8.25	<b>Regional Tractor - Long Haul</b>	8	300	C	Heavy (Value=3)	Variable, 200-500+ miles per day (Value=10)	Future retail charging network? Multiple shift operations impact charging times (Value=10)	Constrained (Value=10)
37	2	<b>Port Drayage</b>	8	120	C	Heavy (Value=1)	Variable, 100-500 miles per day (Value=1)	Variable / Centralized, depending on owner. Multiple shift operations impact charging times (Value=3)	Constrained - short wheelbase (Value=3)
38	3	<b>Pickup Truck - Agriculture</b>	2B-3	500	C or I	Variable-- dependent on type of agriculture. (Value=3)	Assume set routes, <100 miles per day, may have extended idling. Likely extended operation (Value=3)	Centralized (Value=3)	Constrained (Value=3)
39	5.5	<b>Pickup Truck - Contractor</b>	2B-3	5000	C or I	Moderate to heavy (Value=1)	Variable (Value=1)	Variable (Value=10)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/Incomplete	Loading	Routes/Range	Infrastructure/Charging	Battery Space Constraints
40	6	Pickup Truck - Towing	2B-3	3000	C or I	Heavy (Value=1)	Variable-- expect several will have long distance (~500 mile) routes. Towing will significantly shorten available EV range. (Value=3)	Variable (Value=10)	Constrained (Value=10)
41	5.5	Pickup Truck - 4WD Off Road	2B-3	5000	C or I	Light to moderate (Value=1)	Variable-- expect some will have long distance routes. (Value=1)	Variable--off road usage will likely be away from EV grid. Off-highway usage and extended operation will make charging impossible for extended offroad operation. (Value=10)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/Incomplete	Loading	Routes/Range	Infrastructure/Charging	Battery Space Constraints
42	5.5	Pickup Truck - PTO Equipped	2B-3	1500	C or I	Moderate to heavy (Value=1)	Assume set routes, <100 miles per day, may have extended idling. (Value=1)	Variable (Value=10)	Constrained (Value=10)
43	7.75	Line Haul Tractor	4-7	500	C	Heavy (Value=10)	Variable; 500+ mile days (Value=10)	Variable (Value=10)	Open (Value=1)
44	7.75	Line Haul Tractor	8	3000	C	Heavy (Value=10)	Variable; 500+ mile days (Value=10)	Variable (Value=10)	Open (Value=1)
45	10	Logging	8	5	C	Heavy (Value=10)	Variable (Value=10)	Variable, Long off-road travel (Value=10)	Constrained, ground clearance (Value=10)
46	7.75	Concrete Mixer	8	70	I	Typically 50% empty, 5-% grossed out (Value=10)	Highly variable (Value=10)	Centralized, at night (Value=1)	Highly constrained due to body equipment and weight (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/Incomplete	Loading	Routes/Range	Infrastructure/Charging	Battery Space Constraints
47	10	Concrete Pumper	8	37	I	Due to weight of pumping equipment the vehicle is always heavily loaded (Value=10)	Highly variable (Value=10)	Vehicle may remain at construction site for multiple days (Value=10)	Highly constrained (Value=10)
48	4.25	Mining Hauler	8	15	I	Heavy (Value=10)	Fixed (Value=1)	Centralized; Long off-road travel (Value=3)	Constrained (Value=3)
49	4.75	Mining Service	8	15	C	Medium – fixed (Value=3)	Variable (Value=10)	Centralized; Long off-road travel (Value=3)	Constrained, due to body (Value=3)
50	7.75	Heavy Equipment Transport	8	110	C	Heavy (Value=10)	Variable (Value=10)	Variable (Value=10)	Open (Value=1)
51	1.5	Utility/Lube Service	4-7	76	I	Can be heavy (like electrician or plumber) (Value=1)	Can be highly variable, local some days potentially to many sites around municipality in same day (Value=1)	Centralized, at night Can have a need for emergency service (e.g., storms) (Value=3)	Open (Value=1)