Technology Assumptions

Our primary source of analysis for technology assumption is Khan, Cooke, and Tonachel 2015. This analysis synthesizes work produced and commissioned by the National Research Council (TIAX 2009, NRC 2010), the EPA and NHTSA (EPA and NHTSA 2011a, 2011b), and additional sources of information such as the results of the Department of Energy's SuperTruck program (Howden 2014, Rotz 2013) and other industry sources (Cummins 2013, 2014; Eaton 2013; NACFE 2014). The technologies for tractor-trailers, both regional and line-haul; vocational vehicles, including delivery trucks; and pick-ups and cargo vans are all considered separately in this analysis.

To determine what technologies were applicable in this timeframe, the analysis considered a number of factors, including cost-effectiveness and feasibility. In determining cost-effectiveness, the primary consideration was that the technology pay for itself in a reasonable timeframe—in the case of tractor-trailers, this was within two years, while in the case of vocational trucks and pick-up trucks, which drive far fewer miles annually, the target was a five-year payback. In the end, compared to 2010 the tractor-trailers, vocational vehicles, and pick-up trucks/vans achieved average paybacks of 13, 47, and 35 months, respectively (Table A-1).

TABLE A-1. **Technology Package Costs and Effectiveness**

Truck Type	Fuel Economy (MPG)			Total Fuel Consumption Reduction (%)	Total Technology Cost	Annual Fuel Savings	Payback
	2010	2018	2025				
Sleeper Cab (high) Tractor + 3 Trailers	5.8	7.3	11.4	49.1	$40,312	$38,859	12 months
Sleeper Cab (high) Tractor	*5.8*	*7.3*	*9.7*	*40.0*	*$26,992*		
Trailer	*N/A*	*N/A*	*N/A*	*15.2*	*$4,440*		
Sleeper Cab (low) Tractor + 3 Trailers	5.8	7.1	10.2	43.3	$27,717	$34,232	9 months
Sleeper Cab (low) Tractor	*5.8*	*7.1*	*9.5*	*39.1*	*$24,597*		
Trailer	*N/A*	*N/A*	*N/A*	*6.9*	*$1,040*		
Day Cab Tractor + 3 Trailers	5.8	6.4	9.6	39.4	$22,262	$16,603	16 months
Day Cab Tractor	*5.8*	*6.4*	*8.9*	*34.9*	*$19,142*		
Trailer	*N/A*	*N/A*	*N/A*	*6.9*	*$1,040*		
Tractor-Trailer Average	**5.8**	**7.0**	**10.7**	**45.9**	**$31,991**	**$29,964**	**13 months**
Low-speed Vocational Vehicles	6.0	6.6	11.7	48.6	$26,216	$6,657	53 months
High-speed Vocational Vehicles	12.2	13.5	15.5	21.3	$4,249	$1,415	38 months
Vocational Vehicle Average	**9.7**	**10.7**	**14.3**	**32.3**	**$9,741**	**$2,703**	**47 months**
Heavy-duty Pickups and Vans (gasoline)	12.3	13.7	17.4	29.4	$5,050	$1,302	51 months
Heavy-duty Pickups and Vans (diesel)	10.5	12.4	14.3	26.3	$3,293	$1,622	25 months
Heavy-duty Pickup and Van Average	**11.3**	**13.0**	**15.5**	**27.6**	**$4,083**	**$1,478**	**35 months**
Heavy-duty Vehicle Average	**9.6**	**11.0**	**16.2**	**40.6**	**$9,406**	**$5,196**	**22 months**

TRACTOR-TRAILERS

This analysis divides tractor-trailers into three categories: high sleeper cabs, low sleeper cabs, and day cabs. High sleeper cabs are the primary movers of freight in the country, traveling long distances and pulling primarily van trailers. Low sleeper cabs are considered only for specialized trailers. Day cabs tend to travel significantly less distance and often spend less time at cruising speeds, leading to reduced improvement from aerodynamic technologies. Most of the focus of the freight analysis is on sleeper cabs pulling van trailers.

For a baseline sleeper cab, the technology package prevalent is equal to the EPA MY2010 baseline tractor; the technologies applied in the future based on strong standards are based on the sources listed above. Table A-2 outlines some common features assumed in the baseline tractor-trailer fleet as well as what could be possible under strong standards. These default features result in a baseline fuel economy of 5.8 mpg and a future fuel economy of 11.4 mpg for a sleeper cab. These levels of improvement are already being seen via the SuperTruck program, with trucks demonstrating nearly 11 mpg (Howden 2014, Rotz 2013); however, those vehicles are prototypes, and some of those technologies may not immediately transfer to production to vehicles. The specific package of technologies shown to achieve these levels is meant to be representative, not prescriptive—additional packages that could yield similar levels of improvement were identified to arrive at the overall 46 percent improvement in fuel consumption while allowing for manufacturer flexibility, recognizing different strategies and customers.

STRAIGHT TRUCKS

As in the case of the tractor-trailer, an EPA/NHTSA model year 2010 baseline vehicle was selected to represent the current level of technology in the average straight truck unless additional technologies were identified by the company. These represent similar technologies (where applicable) to the tractor-trailer. Engine improvements such as turbocompounding were identified that could see implementation from a rule. The average mpg for a conventional vehicle with the baseline technologies was 9.7 mpg.

A technology identified in the analysis that is particularly relevant to the delivery fleets in this report is the hybrid-electric straight truck. While some fleets are already implementing these vehicles in small numbers, a strong standard could help drive these vehicles into the fleet in sufficient volume to help bring down cost, improving the cost-effectiveness of the vehicle, particularly for those fleets who keep their vehicles for 10 to 15 years. It was assumed that the fleets in question would electrify one-quarter of the vehicles in their fleet. For a fleet that had zero hybrid-electric vehicles initially,

TABLE A-2. **Representative Tractor-Trailer Technologies**

Baseline Vehicle	Technologies Applied Under Strong Standards
Model year 2010 engine with SCR, EGR, and DPF to meet emission standards	Engine friction reduction and improvements to the turbocharger and emissions systems
Variable geometry turbocharged engine	Waste heat recovery / Rankine cycle engine
10-speed manual transmission	Dual-clutch, automated manual transmission
Aerodynamic Class 8 tractor, but no additional aero devices (e.g., tractor or trailer skirts)	Trailer aerodynamic devices (trailer skirts for regional haul; “full package” including gap fairing and a boat-tail/rear fairing for line-haul)
“Standard” tires (average rolling resistance of about 8 kg per ton)	Low rolling-resistance tires (~6.6 kg per ton)
30 percent of sleeper cabs have auxiliary power units but not automatic engine shutdown	100 percent of sleeper cabs have auxiliary power units
No speed limiter below 65 mph	Electrified accessories to reduce idling load

TABLE A-3. **Commodities analyzed in the Freight Analysis Framework**

01	Live animals/fish	12	Gravel	23	Chemical prods.	34	Machinery
02	Cereal grains	13	Nonmetallic Minerals	24	Plastics/rubber	35	Electronics
03	Other ag prods.	14	Metallic ores	25	Logs	36	Motorized vehicles
04	Animal feed	15	Coal	26	Wood prods.	37	Transport equip.
05	Meat/seafood	16	Crude petroleum	27	Newsprint/paper	38	Precision instruments
06	Milled grain prods.	17	Gasoline	28	Paper articles	39	Furniture
07	Other foodstuffs	18	Fuel oils	29	Printed prods.	40	Misc. mfg. prods.
08	Alcoholic beverages	19	Coal-n.e.c.	30	Textiles/leather	41	Waste/scrap
09	Tobacco prods.	20	Basic chemicals	31	Nonmetal min. prods.	43	Mixed freight
10	Building stone	21	Pharmaceuticals	32	Base metals	99	Unknown
11	Natural sands	22	Fertilizers	33	Articles-base metal		

The Freight Analysis Framework divides freight shipment into 43 categories. We have grouped the categories into six main categories of commodity: Agriculture (01, 02, 04, 22); Chemical Products and Plastics (20,23,24); Construction Materials (10-12, 25, 33); Household Goods (see below); Waste (41), and Other (13, 14, 21, 31, 32, 34, 37, 38, 40, 43, 99). We have further broken down the category of Household Goods into subcategories: Meat and Produce (03, 05); Baked and Prepared Foods (06, 07); Alcohol and Tobacco (08, 09); Fossil Fuels (15-19); Magazines, Newspaper, Books, and Paper Goods (26-29); Textiles (30); Electronics (35); Motorized Vehicles and Parts (36); and Furniture (39).

Ag = Agriculture. Prods = Products. Coal-n.e.c. = Products of Petroleum Refining Not Elsewhere Classified and Coal Products. Min = Mineral.

this and additional technology improvements to conventional vehicles would raise the overall fuel economy of a straight truck to 14.3 mpg.

CARGO VANS

Unless otherwise identified, the assumed fuel economy of a cargo van was 12.3 mpg and 10.5 mpg for gasoline and diesel vehicles, respectively. If it was not clear whether a particular fleet employed gasoline or diesel vans, a 45/55 gasoline/diesel split was assumed. Incremental improvements to the engine and powertrain, the addition of stop-start mild hybrid technology, and reductions in road load from lightweighting and low-rolling-resistance tires could reduce fuel consumption from these vehicles by nearly 30 percent.

Commodity Analysis

FREIGHT ANALYSIS FRAMEWORK

The primary resource for the analysis of fuel behind commodities is the Freight Analysis Framework (FAF) (FWHA 2014). We utilized the provisional annual data for 2012, which is temporally as recent as possible and is more representative of today's economy than the finalized 2007 dataset or the 2015 projection, which also relied on the 2007 dataset as its foundation.

The FAF dataset contains a wealth of information about freight movement in the United States. Primarily it consists of a list of trade volumes (in tons, ton-miles, and value) for different commodities. These commodities are defined

BOX A-1. **Example Calculation of Fuel Use Utilizing the Freight Analysis Framework**

The Freight Analysis Framework dataset yields individual trip data for each commodity. Below is one line of data indicating the amount of prepared foods (SCTG #07) shipped by truck from non-urban Pennsylvania to Washington, DC:

Origin	Destination	Mode	SCTG	Value ($M)	Tons (000s)	Ton-Miles (M)
429	111	1	07	67.8444	156.4803	28.05947003

This indicates that the average distance per trip is 28,059,470.03/156,480.3 = 179.3 miles, which for our assumptions means that any tractor-trailer will be considered a regional/day cab, since the trip length is under 200 miles. To obtain the number of tons of freight moved by each type of truck, we utilize the Truck Allocation Factors for a trip between 100 and 200 miles: 31.35 percent single-unit trucks, 4.58 percent truck-trailers, 56.53 percent combination semitrailers, 7.44 percent combination doubles, and 0.05 percent combination triples. For example, this means that 56.53 percent of the 156,480.3 tons of the prepared foods that traveled between Pennsylvania and Washington, DC by truck were transported by a typical tractor-trailer, or 88,453 tons.

To determine the number of trucks that are necessary to transport this quantity of goods, we employ the Truck Equivalency Factors for the commodity (SCTG#07) and truck type (combination semitrailers) in question:

Auto	Livestock	Bulk	Flatbed	Tank	Dry Van	Reefer	Logging	Other
0	0	0	0.00023	0.00373	0.01631	0.01912	0	0

Units of the equivalency factors are fraction of a commodity for a particular truck type normalized to the average payload carried by that truck type.

As expected, this indicates that most of the prepared foods travel by box trailer, either a dry van trailer or a refrigerated van trailer, or "reefer". These values are then multiplied by the Empty Truck Factors that account for the fraction of empty miles traveled by vehicle type. In the case of a dry van trailer, that yields an additional 28 percent increase accounting for the trips without freight. Thus, the total number of trips for combination-trailers pulling a dry van trailer between Pennsylvania and Washington, DC, is 1.28 x 0.01631 x 0.5653 x 156,480.3 = 1847 truck trips. Combined with the combination-trailers pulling flatbed, tank, and refrigerated trailers, a total of 4027 trips are necessary to deliver the 88,453 tons of prepared foods by combination semitrailers each year. Similar calculations are done for each truck type.

To obtain the total amount of fuel used by trucks on these trips, we assume the baseline truck fuel economy for the requisite truck type (in the case of tractor-trailers, this is 5.8 mpg). We then adjust this value based on the average tonnage per trip, since fuel economy is dependent upon the weight of the cargo. Data presented by Cummins to the National Research Council indicated that there was net decrease in fuel economy of 1.2 percent for every additional ton of goods (NRC 2010). The baseline payload assumed in calculating the 5.8 mpg was 17.7 tons for a day cab; the average tonnage of freight moved in this example is 88,453/4027 = 21.96 tons per trip. Therefore, the fuel economy was adjusted downward by 5.1 percent, yielding 5.5 mpg. Putting this all together yields 131,000 gallons of fuel necessary just in shipping prepared foods from Pennsylvania to Washington, DC via combination-trailers. Doing this for all truck types yields 251,000 gallons of fuel used. Now, summing this result over all origin and destination combinations yields a total value of 1.17 billion gallons of fuel needed just to ship prepared foods domestically via truck. To estimate the fuel savings, the same calculation process is used, replacing the baseline fuel economy with the appropriate fuel economy under strong standards.

by the two-digit codes of the Standard Classification of Transported Goods (SCTG), with an additional inclusion of category #99 (Unknown Freight) (BTS 2006). Respondents to the Commodity Flow Survey, which is one of the major resources used to inform the FAF, assigned the five-digit commodity code for each shipment, but the SCTG codes were aggregated to the two-digit level for the FAF dataset. The commodities and their SCTG codes are listed in Table A-3, with the corresponding category of commodities considered in this reported noted.

Each record in the database includes origin and destination of a commodity in addition to the trade type, value, and commodity traded. We limited our analysis to domestic freight movement by truck only. Using the ton-miles and tons of goods traded in each record, we were able to determine the average distance traveled by a commodity for each route. We then used this distance information to allocate the amount of freight transported by the different categories of truck used in the FAF (Single-Unit truck, Truck with Trailer, Combination Semi-trailer, Combination Double, and Combination Triple). Goods moved less than 50 miles are typically transported by Single-Unit trucks (79 percent), while goods moved more than 500 miles travel primarily by tractors pulling one (88 percent) or more (4 percent) semitrailers. Thus, for each trade route, the tons of goods moved by each truck type are calculated.

The sub-category of truck within each type are divided into nine categories: auto, livestock, bulk, flatbed, tank, day van, reefer, logging, and other. In the case of tractor-trailers, this is used to define the trailer type, but in the case of single-unit trucks and truck-trailers, these types are aggregated together in our analysis. The fraction of tonnage of a commodity being transported by a tractor pulling the respective trailer type varies by commodity and is assigned using the Truck Equivalency Factors used by the FAF (Battelle 2011). For example, a dominant fraction of crude petroleum is moved by tank-trailer, while textiles and leather are moved predominantly via day vans and refrigerated trailers.

After taking into account the fraction of empty miles associated with each truck subtype, it is possible to assign the number of trucks of each category that are moving a specified tonnage of goods. Thus, it is possible for any commodity to determine the average tonnage per trip per truck type, which can then be used in calculating a vehicle's fuel economy.

One limitation of the FAF is that it is based on the Commodity Flow Survey (CFS). The CFS surveys "business establishments with paid employees located in the United States and classified as mining, manufacturing, wholesale trade, and selected retail industries (electronic shopping and mail-order houses). Establishments classified in services, transportation, construction, and most retail industries as well as farms, fisheries, most government-owned establishments, and imports have been excluded and are not in-scope to the CFS" (TRB 2006). This means that a significant fraction of last-mile delivery and goods movement between warehouses and retail stores is not represented in the CFS and, therefore, the FAF. It is estimated that the CFS only covers less than 75 percent of all freight tons moved annually in the United States, with local, truck-only goods movement being the primary hole in the dataset (TRB 2006). To account for this shortcoming, we made adjustments based on further survey data as described below.

VEHICLE INVENTORY AND USE SURVEY

Of course, the CFS is not the only survey tool used to examine goods movement. Last conducted in 2002, the Vehicle Inventory and Use Survey (VIUS) conducted by the U.S. Census Bureau surveys all truck owners about their vehicles. Questions include truck make and model, mileage and ownership information, primary range of operation, and details on the goods carried by the vehicle. This data can be used to help fill in some of the gaps in the FAF; however, because the location and trip length is not as detailed, it merely acts to fill in gaps, not as a substitute for the FAF.

COMMODITY INFORMATION IN VIUS

The commodity information in VIUS corresponds nearly identically to the same SCTG codes used by the FAF. However, because a number of survey respondents left some of these questions blank, there is not a clear one-to-one correspondence between the goods movement in VIUS and that of the FAF. Furthermore, it is impossible to distinguish these unknown answers from mixed freight. In a few instances, categories were combined according to the two-letter SCTG code that best corresponded to the more descriptive commodity (Hazardous Waste and Recyclable Products were both classified as #41-Waste/Scrap; Mail and Courier Parcels and Empty Shipping Containers were classified as #43-Mixed Freight).

VEHICLE CATEGORIZATION IN VIUS

Vehicle categorization is significantly more detailed in VIUS than is necessary for estimating the fuel used for freight, divided into 30 different body types and 15 different weight categories. Since we were solely concerned with freight movement, we restricted our analysis to Class 2b-8 trucks that were not Pick-ups, Minivans, Light Vans, or Sport-Utility

Vehicles. We also characterized separately Tractor-Trailers from the other freight-carrying vehicles, just as had been considered in the FAF analysis.

Because some freight-carrying vehicles did not have a commodity code associated with their entry, it is not always clear which trucks are used primarily to ship goods. To determine which vehicles provide freight services, despite not providing a commodity code, we separated out Class 2b-8 trucks that listed an "empty" GVWR in addition to "average", excluding body types associated with buses, whose cargo associated with this weight difference would be passengers. Vehicles of this type were then considered associated with the "Unknown/Mixed Freight" category of vehicles.

ESTIMATING FUEL USE WITH VIUS

Considering each vehicle type and commodity type separately, to estimate the fuel used, we looked to calculating the additional ton-miles of goods shipped with these trucks compared to the FAF data. Because the VIUS data is from 2002, we first scaled the ton-miles of goods by the ratio of 2012 FAF data compared to 2002 FAF data to reflect a similar level of growth. Then, because such a large fraction of VIUS vehicles declared that they shipped "Mixed Freight", we redistributed these ton-miles to any categories for where there was a shortfall between the VIUS and FAF data. This left only a small number of categories with increased ton-miles compared to the FAF, in commodities where it would be expected to have a significant number of regional last-mile hauls like Vehicles or Furniture or in farm-related categories that are known to be undersampled by the CFS such as Live Animals. After obtaining an adjusted ton-mileage for the commodity, the fuel used by this commodity was scaled linearly to reflect this increase.

However, this process ignores the vehicles which carried goods but were not associated with any commodity. The average fuel economy of these vehicles was estimated using self-reported fuel economy and was determined not to be significantly different from the overall VIUS averages; therefore, average vehicle characteristics were assumed for these vehicles. However, self-reported values in VIUS for the average fraction of miles traveled empty were significantly higher for these vehicles than the fractions used in the FAF—this is consistent with the fact that these vehicles were used largely in regional or last-mile hauling (in fact, the single-unit vehicles approached 50 percent utility, as one would expect for last-mile carriage). "Average Number of Hauls per Week" is a question on the VIUS survey—by combining this with the total number of tons shipped and fraction of empty miles, it is possible to estimate the number of ton-miles shipped by these trucks as well as the average payload and distance, which then informs fuel economy in the same way as the FAF data.

TRUCK FUEL ECONOMY

The primary source for fuel economy data was the analysis used by the agencies to support the first phase of fuel economy and greenhouse gas standards for medium- and heavy-duty vehicles (EPA and NHTSA 2011a). Because trucks are kept in the fleet for many years and regulations have only recently taken effect, our estimates of truck fuel economy assume a 2010 model year vehicle, which is the baseline vehicle on which both the first phase of regulations (EPA and NHTSA 2011b) and the analysis supporting a 40 percent reduction in fuel consumption (Khan, Cooke, and Tonachel 2015) are based.

In addition to assessing the average fuel economy of model year 2010 trucks, the regulatory analysis also determined average payloads for the different truck classes. It is well-established that truck fuel economy depends on the freight weight of a vehicle, since more energy is required to move a heavier vehicle. Data from Cummins, Inc. presented to the National Research Council estimated that for every ton of goods, fuel economy is reduced by 1.2 percent (NRC 2010). While this data was based on tractor-trailer fuel consumption, due to lack of better data on single-unit trucks this trend was assumed for all trucks. When combined with the above analysis, this altered fuel economy from the baseline value on a commodity-by-commodity basis, which one would expect when comparing pulling electronics, which "cube out" on a trailer, versus pulling gasoline, which "weighs out". Baseline fuel economy was assumed for vehicles pulling a baseline payload within their respective class—this was then adjusted according to the payload per trip per commodity, yielding differences of about $\pm$ 5 percent for a given commodity compared to the overall average.

Because different commodities are pulled using different trailers, there are also different opportunities for reducing fuel consumption from these vehicles. While van trailers may be made more aerodynamic with a gap reducer, trailer skirt or underfairing, and boat tail or end fairing, it is much more difficult to make such improvements to an auto trailer, for example. Similarly, tractors moving freight over short distances are more likely to be day cabs, which are not going to receive the same benefits from idle reduction as a sleeper cab, and these trucks will spend more of their duty cycle at lower speeds where aerodynamic improvements do not have as much of an effect. Therefore, we segregated the tractor-trailers over a particular commodity trip according to sleeper (> 200 miles) or day (< 200 miles) cab and low- or high-cab design based on trailer type (auto, bulk, flatbed, tank, logging, and other trailers are pulled by low cabs; livestock, day van, and refrigerated van trailers are pulled by high cabs).

OIL CONSUMPTION AND GLOBAL WARMING EMISSIONS

Oil consumption and global warming emissions were calculated for each record and then aggregated at the commodity level. Though there is some additives to fuel that are not derived from petroleum and there may be additional petroleum throughout the refining process, we treated one gallon of diesel or gasoline consumption to translate directly to one gallon of petroleum consumption. However, because the carbon content of diesel and gasoline fuel vary considerably, we considered the emissions to vary per fuel, using the full well-to-wheels emissions according to GREET (ANL 2013).

By and large, most fuel to move freight is used by diesel-powered tractor-trailers. However, in the case of truck-trailers and single-unit trucks, we did account for some fuel usage from gasoline due to the relative fraction of gasoline used in the analysis of the Energy Information Administration (EIA 2013), which yielded 40 percent gasoline usage for light-heavy-duty vehicles and 20 percent gasoline usage for medium-heavy-duty vehicles.

Fleet Analysis

We used publicly available data to estimate each fleet's fuel usage, including press releases, sustainability reports, truck regulations, and industry reports. In some cases, we have adjusted the estimates due to feedback from the respective companies. While we have tried to utilize the same assumptions across the fleets as much as possible, the disparity in data availability has not always made that possible. Below is the process used for each fleet. All fleets include an estimate of the potential fuel economy under strong medium- and heavy-duty vehicle standards (Khan, Cooke, and Tonachel 2015). For fuel prices, we have assumed EIA's projected fuel prices for 2020, discounting by 10 percent to reflect the bulk pricing these large fleets receive under fuels contracts—in the case of diesel, this is $3.31 per gallon, close to the average retail price of 2013. No fuel switching was assumed within a fleet.

UPS

Table A-3 is an estimate of the assumptions surrounding the UPS fleet meant to represent the 2013 fleet fuel consumption. Our estimates of the total technology cost differential is $1.20 billion. Using a 5 percent annual discount rate for future fuel costs, that yields a payback period of 30 months. However, obviously this is highly dependent on fuel costs and the turnover rate for the vehicles—here, for example, we have assumed no incurred penalty for scrapping a vehicle ahead of schedule.

FLEET CENSUS ASSUMPTIONS

For the fleet make-up, as a starting point we relied on the data from Transport Topics from its 2013 Top 100 For-Hire Carriers (Transport Topics 2013a), which yields 102,851 tractors, straight trucks, package cars, vans, and motor cycles; and 83,730 trailers.[1] We then subdivided the "trucks" into tractors and straight trucks/vans based on an assumed tractor/trailer ratio comparable to UPS's main competitor, FedEx, which yields 23,428 tractors; 79,423 straight trucks and vans; and 83,730 trailers. These numbers were then adjusted to 17,000 tractors; 75,000 straight trucks and vans; and 90,000 trailers based on feedback from UPS.

The "tractor" category includes long-haul carriage for UPS Freight in addition to UPS Domestic's "spoke and hub" regional style of delivery. To assess the breakdown of these vehicles, for UPS Freight we assumed the same line-haul/regional breakdown as was used in the EPA regulations (the UPS Freight fleet census is given in the Sustainability

[1] For all other companies, we updated our assumptions with the Transport Topics 2014 Top 100 data; however, in the case of UPS, we had already asked for feedback from the company by the time of the report's release and so did not update our census. The 2014 report did not list trailers and noted 103,000 total delivery vehicles.

TABLE A-3. **UPS Fleet Estimate**

Vehicle Type	#	Fuel Type	2013 mpg	Fuel Use (gal)	Future mpg	Savings (gal)	($)
Line-haul Tractor-Trailer	2,993	Diesel	5.9	63.2M	11.4	30.4M	$100.4M
Line-haul Tractor-Trailer	249	LNG	3.4	9.0M	6.6	4.3M	$5.1M
Regional Tractor-Trailer	13,758	Diesel	5.9	154.8M	9.6	59.0M	$195.1M
Delivery Van (Conventional)	72,500	Diesel	9.7	164.9M	13.4	46.2M	$152.6M
Delivery Van (CNG)	965	CNG	2.4	8.9M	3.0	1.9M	$0.9M
Delivery Van (Electric)	115	Elec.	64.4	717MWh	71.0	153MWh	$0.0M
Delivery Van (Hybrid)	420	Diesel	13.1	0.7M	16.7	0.2M	$0.5M
Delivery Van (Propane)	1000	LPG	6.4	3.4M	8.2	0.7M	$1.5M

Electricity efficiency is given in miles per gallon gasoline equivalent. All other efficiencies are per gallon of particular fuel.

Report, 5759 vehicles [UPS 2014a]). For the remaining tractors, we assumed only regional delivery. This yields in total 3,242 line-haul sleeper tractors and 13,758 regional tractors.

We adjusted the fuel economy of all tractors slightly upwards from the base value of 5.8 mpg to account for the addition of vehicle speed limiters. We assumed a penetration of 50 percent to reflect the fact that while there is widespread deployment of vehicle speed limiters in the UPS fleet, their application may not be appropriate to all routes.

ALTERNATIVE FUEL VEHICLE ASSUMPTIONS

From the latest UPS Sustainability Report, we know that there were 3142 AFVs in UPS's fleet (UPS 2014a). In tractors, we know that the main alternative fuel in question is liquefied natural gas (LNG), with 249 LNG tractors in the fleet in 2013 according to the 2013 sustainability report (and a plan for increasing that to 1,000). Generally, as with other fleets we assumed the same future technology improvements that would result in an estimated 46 percent reduction in fuel consumption by 2025 under strong standards for tractor-trailers (Khan, Cooke, and Tonachel 2015).

For the straight trucks/vans, we know that a lot of different types of alternative vehicles have been tested in UPS's fleet. According to a UPS fact sheet, in 2013 it appears there were 380 hybrid-electric vehicles, 40 hydraulic hybrid vehicles, 115 battery-electric vehicles, and 965 compressed natural gas (CNG) vehicles in the UPS delivery fleet (UPS 2014b). This fact sheet also references a 35 percent increase in fuel economy for hybrids. The efficiency for CNG and LNG is based on energy-equivalence to the similar diesel vehicle. The electric straight truck is based on our estimated efficiency of a Smith Electric van.[2] We assumed a reduced VMT for the electric vehicle according to a press statement noting 100 vehicles would save 126,000 gallons combined with our assumed efficiency of 9.7 mpg for the vehicles they are replacing (1260 × 9.7 = 12,222) based on the EPA and NHTSA's baseline fuel economy for vocational vehicles.

ANNUAL MILEAGE ASSUMPTIONS

Our mileage is based on data from the Vehicle Inventory and Use Survey (VIUS) and the EPA and NHTSA (United States Census Bureau 2004, EPA and NHTSA 2011b), which lists 124,917 annual miles for line-haul sleeper tractor-trailers; 66,601 annual miles for regional day cab tractor-trailers; and 22,087 annual miles for straight trucks and vans. This is consistent with the analysis used to assess the potential for fuel consumption reduction from these vehicles (Khan, Cooke, and Tonachel 2015).

[2] Frito-Lay noted a 75 percent reduction in global warming emissions when using electric trucks, compared to its diesel delivery trucks (EERE n.d.). Our estimate of the diesel vehicle fuel economy is 9.7 mpg. Using total global warming emissions (direct and upstream) for the transportation use of electricity and diesel fuel (ANL 2013), this 75 percent reduction corresponds to a fuel economy for the electric vehicles of 64.4 mpgge.

FEDEX

Table A-4 is an estimate of the FedEx fleet separated by fuel and vehicle type. This fleet is divided into a number of different sub-vehicle types due to increased differentiation given in press, particularly for the van fleet. FedEx can be thought of as three central businesses, each with different truck and delivery needs: FedEx Express, FedEx Ground, and FedEx Freight.

FLEET CENSUS ASSUMPTIONS

We started with the census data from Transport Topics, which yielded a fleet of 25,028 tractors; 62,076 straight trucks and vans; and 92,982 trailers (Transport Topics 2014a). A fact sheet looking at the alternative vehicle fleet from FedEx noted that the FedEx Express fleet consisted of 3,940 Class 7-8 trucks (tractor-trailers); 13,347 Class 4-6 trucks (straight trucks); and 18,320 Class 1-3 trucks (vans) (Electrification Coalition 2012). The latest FedEx Sustainability report noted that an additional 3,700 additional diesel vans had been purchased since the data used in that report (FedEx 2014). We assumed that the remaining "straight trucks and vans" from the Transport Topics report were straight trucks, since they belong to either the Ground or Freight fleet. A recent press release noted the total adoption of 10,000 Sprinter vans and 2,300 Reach vans (Wolski 2013). An additional 200 battery-electric vans were assumed based on a press inquiry to FedEx (Webb 2013).

FUEL ECONOMY ASSUMPTIONS

The FedEx Freight road fleet widely deployed both automatic transmissions (32 percent) and trailer skirts (38 percent) according to the latest FedEx sustainability report (FedEx 2014). These improvements were considered part of the baseline fleet. FedEx ground also included the adoption of 1200 SmartWay-certified trailer skirts and low-rolling-resistance tires. Generally, as with other fleets we assumed the same future technology improvements that would result in an estimated 40 percent reduction in fuel consumption by 2025 under strong standards (Khan, Cooke, and Tonachel 2015).

ANNUAL MILEAGE ASSUMPTIONS

Our mileage is based on data from the Vehicle Inventory and Use Survey (VIUS) and the EPA and NHTSA (United States Census Bureau 2004, EPA and NHTSA 2011b), which lists 124,917 annual miles for line-haul sleeper tractor-trailers; 66,601

TABLE A-4. **FedEx Fleet Estimate**

Vehicle Type	#	Fuel Type	2013 mpg	Fuel Use (gal)	Future mpg	Savings (gal)	($)
Line-haul tractor-trailer	6,623	Diesel	6.0	137.4M	11.4	64.8M	$223.1M
Line-haul tractor-trailer	45	LNG	3.6	1.6M	6.6	0.7M	$0.8M
Regional tractor-trailer	18,350	Diesel	6.0	203.1M	9.6	75.3M	$259.2M
Regional tractor-trailer (hybrid)	10	Diesel	7.1	0.1M	11.3	0.0M	$0.1M
Straight truck	33,703	Diesel	9.7	76.7M	13.5	21.5M	$73.8M
Straight truck	6,008	Gasoline	8.5	15.7M	10.8	3.3M	$9.6M
Straight truck (hybrid)	345	Diesel	13.8	0.6M	17.5	0.1M	$0.4M
Delivery van (conventional)	9,510	Gasoline	9.2	18.3M	13.0	5.4M	$15.5M
Delivery van (M-B Sprinter)	10,000	Diesel	17.0	10.4M	23.1	2.7M	$9.4M
Delivery van (Isuzu Reach)	2,300	Diesel	15.2	2.7M	20.6	0.7M	$2.4M
Delivery van (hybrid)	10	Gasoline	13.8	0.0M	19.6	0.0M	$0.0M
Delivery van (electric)	200	Electricity	61.1	1,907MWh	67.3	177MWh	$0.0M

Electricity efficiency is given in miles per gallon gasoline equivalent. All other efficiencies are per gallon of particular fuel.

annual miles for regional day cab tractor-trailers; 22,087 annual miles for straight trucks; and 17,697 miles for vans. This is consistent with the analysis used to assess the potential for fuel consumption reduction from these vehicles (Khan, Cooke, and Tonachel 2015).

PEPSICO

To more clearly represent the variety in PepsiCo's fleet, we have separated the fleets into Pepsi, Frito-Lay, and Pepsi Logistics (or PLCI) due to the different characteristics of their use (Table A-5).

FLEET CENSUS ASSUMPTIONS

Transport Topics listed the total PepsiCo fleet for 2013 as 12,132 Tractors; 10,548 Trailers; 7,745 Straight Trucks; and 17,761 Pickups and Cargo Vans (Transport Topics 2014b). This is a slightly higher number of total vehicles than is in PepsiCo's Sustainability Report (37,638 > 35,000) (PepsiCo 2014), though the tractor count is lower than that listed by the Pepsi Logistics Company (n.d.).

Tractor Trailers: The Frito-Lay fleet has been previously announced to contain 1,000 tractors; 4,000 trailers; 3,000 straight trucks; and 14,000 cargo vans (Schasel 2007). This number was again given in 2010 (Motavalli 2010). These numbers are consistent with the announcement of 208 CNG tractors for Frito-Lay, which noted that 20 percent of the over-the-road fleet would now be CNG (Content 2013). We thus assumed 1,040 total tractors for Frito-Lay and, using the 4:1 trailer-to-tractor ratio, 4,160 trailers.

We assumed that the Pepsi Beverage fleet thus represents the remaining 6,388 trailers. Due to the nature of Pepsi's business (bulk and local delivery), we assumed a 1:1 trailer-to-tractor ratio, yielding 6,388 delivery tractors. Bay trucks are the delivery vehicles that service many small deliveries, such as convenience stores. Bulk tractors, on the other hand, have limited stops and service large operations like grocery stores. To obtain the number of bay versus bulk trucks, we used published data on the fleet at the Denver bottling plant, which yielded a 2:1 ratio (Roadnet Technologies 2011). 140 of the bulk trucks were identified as hydrogen-diesel tractors (Fletcher 2012).

After accounting for the trailers in the Pepsi and Frito-Lay fleets, it was assumed that the remaining tractors are used by the Pepsi Logistics Company, Inc., primarily for inbound freight from suppliers. These were assumed to be regional haul vehicles, since they operate out of Pepsi/Frito-Lay facilities.

Cargo vans: It was noted earlier this year that Pepsi is replacing much of its van delivery fleet with Sprinter vans. Currently, there are 300 Sprinters, making up 15 percent of the fleet, meaning that the total van fleet for Pepsi must be only 2,000 vans (Kaplan 2014). 100 of those vans have been retrofitted with a hybrid powertrain from XL Hybrids. Traditional cargo vans were identified as gasoline-fueled based on the net greenhouse gas improvements of the Sprinter vans (see fuel economy estimates below).

The remaining vans (15,761) are assumed to be part of Frito-Lay's fleet. Such numbers are not significantly different than previous fleet size estimates (Schasel 2007). Of these, at least 3,000 are identified as diesel Sprinter vans (Motavalli 2010).

Box trucks: 267 hybrid electric delivery trucks were identified across PepsiCo's fleet (Frito-Lay North America 2012). 200 of those were noted as Pepsi Beverage vehicles (Pepsi Beverages Company, 2011), with the remainder assumed to be Frito-Lay. In total 3,000 box trucks were assumed for the Frito-Lay fleet (Schasel 2007), including 280 all-electric trucks from Smith Electric (PepsiCo 2014). The remaining vehicles were assigned to Pepsi Beverages.

FUEL ECONOMY ASSUMPTIONS

Cargo Vans were estimated at 11 mpg, while Sprinter vans average a more efficient 17 mpg (Dao 2009). The retrofit XL Hybrid Cargo Van showed a 20 percent improvement in fuel economy (Kaplan 2014). The conventional diesel box truck was assumed to be equivalent to the EPA baseline value for vocational trucks (9.7 mpg), which is also consistent with GHG savings of 20 percent for switching to hybrids (Pepsi Beverages Company 2011). The electric box truck showed a 75 percent reduction in GHG emissions compared to the conventional box truck, which we calculated to be equivalent to 64.4 mpgge (EERE n.d.).

According to Pepsi, its bulk tractor-trailers average 6.2 mpg, with hydrogen-injected diesel tractors getting a 15 percent improvement in fuel economy (Fletcher 2012). For the bay trucks, we assumed 5.8 mpg, the same as the baseline value for EPA—this is close to the value for beverage tractor-trailers in VIUS (United States Census Bureau 2004). The over-the-road (OTR) tractor-trailers in Frito-Lay's fleet were assumed to average about 6.0 mpg based on improvement to the baseline from trailer skirts (Schasel 2007), low-rolling-resistance tires, and an automatic sliding tandem axle on some trailers (Cirillo 2013).

Generally, as with other fleets we largely assumed the same technology assumptions that would result in an estimated 40 percent reduction in fuel consumption by 2025 under strong standards (Khan, Cooke, and Tonachel 2015). However, no aerodynamic improvements to the underside of the bay-style beverage trailers were assumed due to the design of the trailer. Because the tractors are not sleeper cabs, no idle reduction was assumed, either.

ANNUAL MILEAGE ASSUMPTIONS

Mileage assumptions for cargo vans and box trucks and the bay beverage tractor-trailers come from VIUS (United States Census Bureau 2004). The mileage for the bulk tractor-trailer was based on Pepsi's commentary to the press (Fletcher 2012). The reduced mileage for the electric box truck was based on the two years of service—three million miles were

TABLE A-4. **PepsiCo Fleet Estimate**

Pepsi	#	Fuel Type	Average Annual VMT	Average Fuel Economy	Fuel Usage
Bulk Tractor-Trailer	1,989	Diesel	200,000	6.2 mpg	64.2 M gals
Bulk Tractor-Trailer	140	H_2 + Diesel	200,000	7.1 mpg	4.0 M gals
Bay Tractor-Trailer	4,259	Diesel	20,099	5.8 mpg	14.8 M gals
Box Truck	4,545	Diesel	22,087	9.7 mpg	10.3 M gals
Box Truck (Hybrid)	200	Diesel	22,087	12.1 mpg	0.4 M gals
Sprinter Van	300	Diesel	17,697	17.0 mpg	0.3 M gals
Cargo Van	1,600	Gasoline	17,697	11.0 mpg	2.6 M gals
Cargo Van (XL Hybrid)	100	Gasoline	17,697	13.2 mpg	0.1 M gals

Frito-Lay	#	Fuel Type	Average Annual VMT	Average Fuel Economy	Fuel Usage
OTR Tractor-Trailer	832	Diesel	78,264	6.0 mpg	10.8 M gals
OTR Tractor-Trailer	208	3600-psi CNG	78,264	1.5 mpg	*10.8 M gals
Box Truck	2,653	Diesel	22,087	9.7 mpg	6.0 M gals
Box Truck (Hybrid)	67	Diesel	22,087	12.1 mpg	0.1 M gals
Box Truck (Electric)	280	Electricity	14,423	2.0 mi/kWh	2.0 GWh
Sprinter Van	3,000	Diesel	17,697	17.0 mpg	3.1 M gals
Cargo Van	12,761	Gasoline	17,697	11.0 mpg	20.5 M gals

* This is the compressed volume of natural gas used on the truck. This is equivalent to the energy of 1.4 billion cubic feet of natural gas.

Pepsi Logistics Company	#	Fuel Type	Average Annual VMT	Average Fuel Economy	Fuel Usage
Regional Tractor (TL)	4,330	Diesel	66,601	5.8 mpg	49.7 M gals

traveled in the first two year by 13 vehicles purchased in 2010 and 182 more purchased in 2011 (PepsiCo 2013), and that averages out to 14,423 miles per vehicle-year. Frito-Lay's OTR Tractor-Trailers were assumed to be an 80/20 mix of regional tractors and line-haul tractors to be consistent with the savings noted for CNG OTR tractor-trailers (Motavalli 2012).

THE COCA COLA COMPANY

Coca-Cola has published very little data on the specifics of its fleet, with press releases focusing solely on its alternative vehicles. For this reason, many of the assumptions of the Coca-Cola fleet are based on similar vehicles in PepsiCo's beverage fleet assuming a similar business practice. The assumed fleet profile is given in Table A-6.

FLEET CENSUS ASSUMPTIONS

Transport Topics lists the total Coca-Cola fleet for 2013 as 7,479 Tractors; 9,523 Trailers; 1,901 Straight Trucks; and 3,690 Cargo Vans (Transport Topics 2014b). Coca-Cola's Sustainability Report (2014) only lists the global fleet (which at 150,000 is obviously much larger), but the Transport Topics numbers are higher than those by FleetOwner (2014), which yield only 8,036 total power units (though that number excludes cargo vans). The Fleet Operations Director noted 25,000 assets on the road, but that looks beyond delivery vehicles; 7,000 of those vehicles are bay trucks, while 3,000 are OTR tractors (FC Business Intelligence 2013). We used a 7:3 ratio for bay:OTR operation for Coca-Cola—this is close to the assumed 2:1 ratio for Pepsi's beverage fleet.

In 2009, there was nearly an even split in hybrid tractors and hybrid straight trucks—out of the 327 hybrid vehicles, 150 were tractors and 177 were straight trucks (Mika 2009). By the end of 2010, Coca-Cola had more than 600 hybrid delivery vehicles on the road (Van Mullekom 2010). In its latest sustainability report, its total alternative-fuel fleet had grown to 870 vehicles, including 12 line-haul natural gas tractors (FC Business Intelligence 2013), 31 electric straight trucks (Priselac 2013), and 100 retrofit hybrid-electric cargo vans (The Coca-Cola Company 2014). We assumed that the remaining 727 vehicles were hybrid-electric vehicles, assigning them proportionally to the 150:177 tractor:truck ratio from 2009, yielding 333 hybrid tractor-trailers and 394 hybrid straight trucks. All hybrid tractors are considered to be local delivery vehicles.

TABLE A-6. **Coca-Cola Fleet Estimate**

Vehicle Type	#	Fuel Type	2013 mpg	Fuel Use (gal)	Future mpg	Savings (gal)	($)
OTR bulk delivery tractor-trailer	2232	Diesel	5.8	80.0M	10.7	35.1M	$120.7M
OTR bulk delivery tractor-trailer	10	CNG	1.4	1.4M	2.6	0.6M	$0.3M
OTR bulk delivery tractor-trailer	2	LNG	3.4	0.1M	6.2	0.1M	$0.1M
Bay delivery tractor-trailer	4902	Diesel	5.8	17.0M	9.2	6.3M	$21.7M
Bay delivery tractor-trailer (hybrid)	333	Diesel	6.6	1.0M	9.8	0.3M	$1.1M
Straight truck	1476	Diesel	9.7	3.4M	12.5	0.7M	$0.5M
Straight truck (hybrid)	394	Diesel	12.6	0.7M	16.0	0.1M	$0.5M
Straight truck (electric)	31	Electricity	64.4	349.6MWh	81.9	74.5MWh	$0.0M
Cargo van	3590	Gasoline	11	5.8M	15.6	1.7M	$4.9M
Cargo van (hybrid)	100	Gasoline	13.2	0.1M	18.7	0.0M	$0.1M

OTR = over-the-road

Electricity efficiency and CNG efficiency is given in miles per gallon gasoline equivalent. All other efficiencies are per gallon of particular fuel.

FUEL ECONOMY ASSUMPTIONS

Fuel economies of the tractor-trailers and conventional straight trucks were taken from the EPA baseline averages. Fuel economy of the conventional cargo van was estimated to be the same as Pepsi's vans. The natural gas tractors were assumed to have the same energy efficiency as the diesel engines, but the fuel economy takes into account the lower energy density of the natural gas fuel. The hybrid tractor-trailer's increase in fuel economy of 13.7 percent comes from a case study of Coca-Cola vehicles (NREL 2012). Improvements to hybridization of the straight truck (The Coca-Cola Company 2013) and cargo van (Seward 2013) come from Coca-Cola.

Generally, as with other fleets we largely assumed the same future technology improvements that would result in an estimated 40 percent reduction in fuel consumption by 2025 under strong standards (Khan, Cooke, and Tonachel 2015). However, no aerodynamic improvements to the underside of the bay-style beverage trailers were assumed due to the design of the trailer. Because the tractors are not sleeper cabs, no idle reduction was assumed, either.

ANNUAL MILEAGE ASSUMPTIONS

Mileage assumptions for cargo vans and box trucks and the bay beverage tractor-trailers come from VIUS (United States Census Bureau 2004). The mileage for the bulk tractor-trailer was based on Pepsi's commentary to the press (Fletcher 2012), and with limited available data for Coca-Cola we assumed the same business practice.

WALMART

Table A-7 lists an inventory of the vehicles that we estimate Walmart's fleet to contain. These estimates were obtained with publicly available data, described in further detail following the table. We have included the total number of trailers for the sake of completeness, but any improvements to the trailers are included in the fuel economy of the tractor-trailers, and we do not treat the trailers themselves as fuel consumers. Though we know there may be some refrigerated trailers in the Walmart fleet that would use fuel, we were unable to find any references for the number of "reefers" in the fleet or their fuel usage.

FLEET CENSUS ASSUMPTIONS

Transport Topics in its Top 100 Private Fleets (2013) listed the total Walmart fleet for 2012 as containing 6,523 Tractors; 61,743 Trailers; 38 Straight Trucks; and 768 Pickups and Cargo Vans. In its Top 100 Private Fleets (2014), the 2013 fleet is given as 6,239 Tractors and 61,743 Trailers. We have chosen to maintain the older straight truck and van numbers since it is possible that the updated census did not necessarily include medium-duty vehicles used primarily in warehouse operation. However, neither assumption has a significant impact on the overall fleet fuel use since the primary fuel

TABLE A-7. **Walmart Fleet Estimate**

Vehicle Type	#	Fuel Type	2013 mpg	Fuel Use (gal)	Future mpg	Savings (gal)	($)
Tractor-trailer	6229	Diesel	6.9	100.3M	11.4	35.1M	$136.5M
Tractor-trailer	5	CNG	5.1	220k	8.4	0.1M	$40k
Straight truck	38	Diesel	9.7	90k	14.3	0.0M	$100k
Pick-up/Cargo van	422	Diesel	10.5	710k	14.3	0.2M	$600k
Pick-up/Cargo van	346	Gasoline	12.3	500k	17.4	0.1M	$300k
Van trailers	61,743	—	—	—	—	—	—

M = millions; k = thousands; gge = gallon of gasoline equivalent

CNG efficiency and use is given in gallons of gasoline equivalent. All other efficiencies are per gallon of particular fuel.

consumers are diesel-powered tractor-trailers.

FUEL ECONOMY ASSUMPTIONS

Within the tractor-trailer fleet, the only alternative fuel use identified were two press releases around the testing of 5 CNG (Stutman 2013) and 5 LNG (TruckingInfo 2012) tractors. The CNG tractors were identified as operating more closely to day cabs in communication with Walmart. The LNG test fleet is no longer part of Walmart's current operations.

Our base vehicle technology package is equivalent to the EPA MY2010 baseline tractor, which yields a baseline fuel economy of 5.8 mpg. However, Walmart has already adopted a number of technology improvements to its truck fleet, including mandating the most aerodynamic tractors, widespread deployment of auxiliary power units (APUs) to reduce idling emissions (Berg 2007), deployment of trailer skirts to improve the aerodynamics of about 25 percent of its trailers Walmart's 2011 and 2012 sustainability reports), and driver training to reduce idle and optimize shifting technique: these yielded a 15 percent reduction in fuel consumption compared to the baseline, leading to a fuel economy of 6.9 mpg. No additional data was found on the efficiency of the box trucks or vans, so their efficiency was simply the EPA baseline, including the fraction of diesel/gasoline vans (55 percent diesel).

For future fuel economy, as with other fleets we largely assumed the same technology assumptions that would result in an estimated 40 percent reduction in fuel consumption by 2025 under strong standards (Khan, Cooke, and Tonachel 2015).

ANNUAL MILEAGE ASSUMPTIONS

Our mileage is based on data from the Vehicle Inventory and Use Survey (VIUS) and the EPA and NHTSA (United States Census Bureau 2004, EPA and NHTSA 2011b), which lists 124,917 annual miles for line-haul sleeper tractor-trailers; 66,601 annual miles for regional day cab tractor-trailers; 22,087 annual miles for straight trucks; and 17,697 miles for vans.

In the 2014 Sustainability report, Walmart notes that compared to 2012, there was a 4 percent improvement in freight efficiency, delivering 181 million more cases but driving 167,000 fewer miles (Walmart 2014). Without that improvement, those cases would have required 34 million more miles than the previous year. Assuming little to no improvement in fuel economy year-over-year, this yields a total mileage of 854,342,000 miles traveled, or about 131,000 miles per truck. This number is close to our assumed 124,917 miles per tractor-trailer; however, after speaking with Walmart, this number was revised downward.

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