EXECUTIVE SUMMARY

This Regulatory Impact Analysis (RIA) provides an assessment of the costs and benefits of potential changes in Department of Transportation Federal Motor Carrier Safety Administration (FMCSA) Hours of Service (HOS) regulations. The HOS regulations address the number of hours that a commercial motor vehicle driver (CMV) may drive, and the number of hours a CMV driver may be on duty, after which driving is prohibited until a minimum off-duty rest period is taken.

A new HOS rule was promulgated on April 28, 2003 (68 FR 22456) and implemented on January 4, 2004 with the goal of reducing the incidence of fatigue-related crashes. That rule increased the required rest between tours of duty from 8 to 10 hours (which could be split into two sleeper-berth periods under some conditions), allowed drivers to restart their calculation of duty hours in a multi-day period if they took a continuous off-duty break of at least 34 hours, and lengthened the driving period between offduty rest periods from 10 to 11 hours.

After the new rule had been in effect for several months, it was vacated by the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit). [*Public Citizen et al. v. Federal Motor Carrier Safety Administration*, 374 F.3d 1209, at 1216.] The D.C. Circuit found, on July 16, 2004, that FMCSA had not considered effects on drivers' health. It also expressed concerns about the 11th driving hour, the restart of the multi-day duty-hour calculation, the use of sleeper berths to split the rest period, and the lack of consideration of electronic on-board recorders. In response to the court's action, Congress extended the 2003 rule for a year, in order to give FMCSA a chance to revisit the issues cited by the court. As such, the FMCSA has reexamined its HOS regulations in light of the D.C. Circuit *Public Citizen* decision.

ES.1 OPTIONS

This analysis considers and assesses the potential consequences of four potential regulatory options.

Option 1 is the continued implementation of the current 2003 HOS regulations, with no additional rule changes and no changes in the method of implementation. The FMCSA would continue to enforce the current HOS regulations. The existing exemptions to the current HOS regulations under the NHS Act would remain in effect.

Option 2 changes the regulations in a way that is intended to improve safety while maintaining their most important advantages: it constrains the use of sleeper berths to ensure that each sleeper berth period is at least 8 hours, and is supplemented by a 2-hour break that may be outside the sleeper berth.

Options 3 and 4 are more stringent than Options 1 or 2. Operators are limited to 10 (rather than 11) hours of driving in a tour of duty, the use of split sleeper berth periods is eliminated, and the length of the restart break is expanded to 58 hours in Option 3 and 44 hours in Option 4.

In addition, for Options 2, 3, and 4, short-haul operators of vehicles not requiring a commercial driver's license (CDL), or typically those of less than 26,000 lbs gross vehicle weight rating (GVWR), and remaining within a 150 mile radius of their base, may keep timecards in lieu of

logbooks and may be on-duty up to 16 consecutive hours two days during a seven-day work week.

ES.2 OVERVIEW OF THE ANALYSIS

The analysis of costs recognizes that the different provisions of the options will affect carrier operations in complex and interacting ways. It also recognizes that these effects will depend strongly on the carriers' baseline operating patterns, which vary widely across this diverse industry. To produce a realistic measurement of the impacts of each option, we divided the industry into broad segments, collected information on operations within these segments, and then created a model of carrier operations as they are affected by HOS rules. Given the very wide array of operational patterns, it was necessary to limit the analysis to the most important cases.

The model was first loaded with data representative of shipping patterns and carrier cost structures, and tested to ensure that it could realistically simulate typical lengths of haul, empty mile ratios, and productivity. It was then set up to cover most important cases, under constraints representing each option, and used to simulate carrier operations under different conditions and HOS rules. We then analyzed the data representing the simulated operations, using changes in miles driven as a measure of productivity impacts. Output measures from individual runs were weighted to give a realistic representation of the affected industry, including the drivers' use of the most important provisions of the options. The weighted changes in productivity from this procedure were then used to estimate the cost increases imposed on the industry by each option, using an analysis of the changes in wages and other costs likely to result from changes in productivity. These productivity-related costs were combined with transition costs associated with shifting to new rules to produce estimates of total social costs.

Safety impacts were measured by feeding the on duty and driving schedules from the carrier simulation model into an operator fatigue model to project driver effectiveness levels, and then using the fatigue model results to estimate the resulting changes in crash risks under each HOS option and for the different operations cases. Changes in fatigue-related crash risks, calibrated to match realistic levels, were then multiplied by the value of all affected crashes to yield estimates of total benefits.

Finally, impacts on affected carriers were assessed using a pro-forma model of carrier operations for different carrier sizes, allowing for the effects of changes in driver wage rates and prices of trucking services.

ES.3 RESULTS

The results of the analysis are presented in two parts: for long-haul (LH) operations, and then for short-haul (SH) operations. The results of the simulation modeling of LH operations are shown in Exhibit ES-1, which presents impacts for drivers in operations of different average lengths of haul (short regional or SR, long regional or LR, and long-haul or LH), different degrees of schedule regularity (random or regular), different work weeks (those working five as opposed to six days per week), different sleeper berth usage, and for solo drivers and teams. The impacts on driver productivity of Options 2, 3, and 4, relative to Option 1, varied widely for runs

simulating these different types of operations. The impacts tended to be greater for drivers assumed to take advantage of split sleeper berths, for drivers with short to moderate average lengths of haul. Overall, though, eliminating the split sleeper berth break appeared to be of minor importance for the productivity of solo drivers. This observation is likely due to the fact that, while the opportunity to initiate a split break provides flexibility, the rules for using this feature imparts rigidity to a driver's schedule for subsequent tours of duty. The fact that the change in the rules for splitting breaks is the only difference between Options 1 and 2, combined with the lack of a large productivity impact from restrictions on splitting and limited use of splitting, means that the productivity impacts of Option 2 are slight.

Exhibit ES-1
Estimated Changes in Long-Haul Productivity by Option and Case

			Option 2 Compared to Option 1	**Option 3 Compared to Option 1**	**Option 4 Compared to Option 1**
Run characteristics			**Relative Reduction in driving hours**		
For-hire, random	Using split sleeper berths	Short Regional (SR)	1.1%	24.9%	10.3%
		Long Regional (LR)	5.9%	26.2%	19.4%
		Long Haul (LH)**	-3.1%	17.9%	9.6%
	No split sleeper berths	SR	0%	24.1%	9.3%
		LR	0%	21.4%	14.2%
		LH	0%	20.4%	12.5%
Regular Routes (Private TL, LTL, regular for-hire)	Full weekend off	Weekly route	0%	16.1%	5%
		Daily route**	0%	-2.0%	-1%
	Six-day work week	Weekly route	0%	29.2%	19%
		Daily route	0%	8.9%	10%
Team drivers*	Using split sleeper berths		0%	5.0%	5.0%
	No split sleeper berths		0%	5.0%	5.0%

* These impact estimates were based on simplified scenarios rather than model runs.

** These negative impacts are the results of random factors in the simulation, and would not persist if they were repeated a large number of times.

Because they limit driving hours and require longer restart periods, the relative productivity loss caused by Options 3 and 4 are substantially greater than that for Option 2 in almost all cases. Also, in almost all cases, the impact of Option 3 is greater than that of Option 4, due to the longer restart required under Option 3. The impacts of changes in the restart period are particularly large for the random drivers, whose lack of a regularly scheduled off-duty period means that a short restart can be very advantageous. For Options 3 and 4, the team drivers were expected to lose 5 percent of their productivity as a result of the loss of the 11th hour of driving: even if the members of a driving team want to average only 10 hours of driving per day, random factors will tend to push them slightly over 10 hours on some days, and slightly under on other

days. If they are limited to no more than 10 hours, however, they will tend to average somewhat less than 10 hours as a result of the times when they cannot use all of the 10 hours that are permitted. No impacts are seen for team drivers under Option 2 because of the ability of team drivers to achieve the same productivity whether or not they split their break periods.

The productivity impacts shown in ES-1 were weighted to produce an industry-wide estimate of average impacts using data on the prevalence of different operating patterns and different degrees of use of several important features of the existing HOS rules. The weighted productivity impacts, which are shown in Exhibit ES-2, came to -0.042% for Option 2, -7.12% for Option 3, and -4.61% for Option 4, all relative to Option 1.

The impact of these changes in productivity were estimated using analyses of the changes in costs (for labor and equipment) as a function of changes in hours worked, due to the need to hire more drivers as the productivity of each existing driver is reduced. These analyses showed that each one percent change in driver productivity is associated with just under $300 million in costs. Multiplying the weighted average productivity impacts by the costs per percent decrease in productivity yields $13 million, $2.12 billion, and $1.37 billion per year for the incremental effects of Options 2, 3, and 4, respectively. In addition, retraining of drivers and other personnel is expected to add an annualized $21 million to the costs of Options 2, 3, and 4. It should be noted here that while retraining costs may in fact vary somewhat by Alternative Option, the RIA for today's rule assumed these costs are constant. For example, under Option 2, while it might be the case that certain carriers would only retrain their long-haul drivers who currently use the sleeper berth provision, it may also be the case that some carriers would want to train their entire driver workforce (depending on how many drivers currently use the sleeper berth provision versus those who may use it in the future). As such, retraining costs for Option 2 could be considered conservative, in that they may overrepresent the true retraining costs associated with this option.

The total cost impacts of the options on the LH sector, relative to Option 1, are shown in Exhibit ES-2. ES-2 also shows anticipated changes in LH drivers (not counting small changes related to mode shift).

Exhibit ES-2
Incremental Annual Costs of the Options for LH Operations
Relative to Option 1

	Option 2	Option 3	Option 4
Change in LH Productivity	0.042%	7.12%	4.61%
Change in Annual Costs due to Productivity Impact (millions of 2004$)	$13	$2,121	$1,374
Incremental Annualized Retraining Cost (millions of 2004$)	$21	$21	$21
Total Annual Incremental Cost	$34	$2,142	$1,395
Increase in Numbers of Drivers	600	107,000	69,000

Source: ICF analysis.

Cost Impacts of the Options on SH Operations

The analysis concentrates on the LH segment of the motor carrier industry because the major HOS provisions differentiating the four alternative options considered here are expected to have little or no effect on local and SH operations. Two provisions of Options 2, 3, and 4, however, affect only local/SH drivers: the exemption from keeping log books, and a second 16-hour day in each week. These two provisions apply only for drivers of vehicles between 10,000 and 26,000 lbs. GVWR that stay within a 150 air-mile radius of their base of operations, and return to that base at the end of each tour of duty.

We have estimated the cost impacts of these provisions by dividing local/SH vehicles into a limited set of cases, determining the time savings of the log-book exemption for each vehicle in each case, and valuing those savings per vehicle. We then estimated the number of vehicles in each case, multiplied by the savings per vehicle, and summed across the cases.

We estimated the savings from the second 16-hour day per week using a variant of the analysis of the savings from the first 16-hour day per week, which was conducted for the 2003 RIA. Those estimated savings were translated into an annual per-vehicle value, and then scaled appropriately for our estimate of the number of affected vehicles. These cost estimates are shown in Exhibit ES-3.

Exhibit ES-3
Summary of Local/SH Analysis
(Annual Savings in Millions of 2004$, rounded to the nearest $10 million)

	Case 1	Case 2	Case 3	Total Annual Savings (millions)
Description	Now operating within 100-mile range and not keeping logs. Duty tours ≤ 12 hours.	Now operating within 100-mile range and keeping logs. Duty tours up to 14 hours.	Now operating in 100-150 mile range. Must keep logs and observe 14-hour limit.	
Log-book effects	No effect; already exempt from log requirement. Benefit: $0	Relieved from log requirement. Benefit: $100.	Relieved from log requirement. Case-3 benefit: $40	$140
14-hour tour with log-book exemption	May use 14-hour tour now, if they keep log. Tour>12 hours is of little value to this group. Benefit: minimal	Already choosing log-book and 14-hour tour. Benefit: zero	Already have 14-hour tour. Benefit: zero	$ 0
Second 16-hour day	Would not use the 16-hour day because they already choose not to use the 14-hour tour. Savings: $0	Analysis is an extension of analysis of second 16-hour day that was done for the 2003 RIA. This approach did not distinguish between Cases 2 and 3. Productivity Benefits: $140		$140
Total				$280

Source: ICF analysis. See Appendix (IV).

Crash Risk Results by Operational Case

The results of the crash risk modeling are presented in the table below, after scaling the results to yield an average fatigue-related value of 7 percent in Option 1. Overall, the impacts are relatively small, as might be expected for options that are making marginal changes in an existing rule. Weighting the crash risk results in the same manner as the productivity results, we found the overall changes in crash risks to be small. Option 2 resulted in a risk reduction of about 0.1 percent, while Options 3 and 4 each provided a risk reduction of about 0.6 percent.

Exhibit ES-4
Incremental Crash Risk Estimates

			Option 2 Compared to Option 1	**Option 3 Compared to Option 1**	**Option 4 Compared to Option 1**
Run characteristics			**Relative Change in Crash Risk**		
For-hire, random	Using split sleeper berths	Short Regional (SR)	-7.4%	-6.3%	-2.4%
		Long Regional (LR)	1.4%	-5.6%	-7.5%
		Long Haul (LH)**	2.0%	-7.2%	-7.6%
	No split sleeper berths	SR	0%	1.1%	5.0%
		LR	0%	-6.9%	-8.9%
		LH	0%	-9.3%	-9.6%
Regular routes (Private TL, LTL, regular for-hire)	Full weekend off	Weekly	0%	0.2%	-0.4%
		Daily	0%	-0.7%	-0.3%
	Six-day work week	Weekly	0%	-0.7%	-1.2%
		Daily	0%	-0.9%	-0.5%
Team drivers*	Using split sleeper berths**		-5.7%	-6.4%	-6.4%
	No split sleeper berths		0%	-0.7%	-0.7%
Weighted Average Impacts (raw)			-0.3%	-1.4%	-1.4%
Weighted Average Impacts (scaled)			-0.1%	-0.6%	-0.6%

* These impact estimates were based on simplified scenarios rather than model runs.

** These scenarios assumed time-on-task effects for split sleeper berth cases are of the same magnitude as in equivalent non-split cases. Reductions in crashes would be smaller if split rest periods eliminate time-on-task effects.

Value of the Crash Risk Changes

These percentage changes in risk were valued by multiplying them by an estimate of the total annual damage associated with heavy-duty long-haul truck crashes. For consistency with the earlier analysis, we have used the value from the previous analysis of $32.2 billion in year 2000

dollars, or about $34.9 billion in year 2004 dollars. This was done so that the RIAs for the 2003 rule and today's rule would be as closely linked as possible, such that the comprehensive economic effects of the two analyses could be examined together. This total was multiplied by the percentage of total damages that were caused by the long-haul segment, yielding just over $20 billion. The reduction in risk attributable to Option 2, given this total value, is 0.1% * $20 billion or about $20 million per year. The risk reduction attributable to Options 3 and 4 is higher, at about $120 million per year. Changes under Options 3 and 4 are much smaller than the cost changes attributable to the options. The crash risk impacts of the local/SH changes are expected to be negligible.

Net Costs by Option

Exhibit ES-5 summarizes the annualized costs, benefits, and net costs of each of the options relative to Option 1. Both LH and local/SH effects are shown. The values have been rounded to the nearest $10 million, in line with the values presented for the local/SH impacts.

Exhibit ES-5
Net Incremental Annual Costs of the Options Relative to Option 1
(millions of 2004$, rounded to nearest $10 million)

		Option 2	Option 3	Option 4
Total Annual Incremental Cost	**LH**	$30	$2,140	$1,390
	SH	-$280	-$280	-$280
Total Crash Reduction Benefits	**LH**	$20	$120	$120
	SH	~0	~0	~0
Net Annual Costs		-$270	$1,740	$990

Source: ICF analysis.

Sensitivity Analysis for a 10-hour Driving Limit

In addition to examining options 2, 3, and 4 relative to Option 1, a variant of Option 2 was considered. This variant combined the other features of Option 2 with the 10-hour driving limit included in Options 3 and 4. This option was found to be considerably less cost-effective than the basic version of Option 2, as shown in the first row of Exhibit ES-6. Whereas Option 2 has net benefits of $270 million per year, the 10-hour variant has net benefits of *negative* $256 million per year (i.e., it has net costs). The conclusion that imposing a 10-hour driving limit was not cost-effective was tested by reexamining costs and benefits under a series of sensitivity assumptions, which are shown in the other rows of Exhibit ES-6. Doubling the assumed use of the 11th hour increased the *net costs* of the 10-hour variant from $256 million to $782 million, making Option 2 with 10 hours driving even less cost effective relative to Option 2. More than tripling the value for each statistical life saved (from $3 million to $10 million) improved the relative cost effectiveness of Option 2 with 10 hours driving, but it was still neither cost beneficial on its own (with net costs of $170 million) nor cost effective relative to Option 2. Also, raising the relative risk of a fatigue-related crash in the 11th hour of driving by 1.4 times the value used in time-on-task (TOT) multiplier in the RIA did not make Option 2 with 10 hours

driving cost effective relative to Option 2 ($232 in net costs versus $270 in net benefits respectively), nor did substantially raising the baseline level of fatigue in truck-related crashes (i.e., $189 million in net costs for Option 2 with 10 hours driving relative to $287 million in net benefits for Option 2). Each change improved the showing of the 10-hour variant, but still left it with net costs rather than net benefits. Only in a very unlikely scenario that combines all three of the assumptions favorable to the 10-hour limit does the 10-hour variant show any net benefits. Even in this scenario, though, its net benefits are far below that of Option 2 without the 10-hour restriction, indicating that it is implausible that eliminating the 11th hour would be cost-effective.

Exhibit ES-6
Sensitivity Analyses of Net Benefits, 10-hour Driving Limit
(millions of 2004$)

	Net Benefits of Option 2	Net Benefits of Option 2 w/10 hrs
Basic Assumptions	270	-256
Twice as Much Use of 11th Hour	270	-782
Higher Value of Statistical Life (VSL)	291	-170
Higher TOT Impact	270	-232
Higher Baseline Fatigue	287	-189
Higher VSL, TOT Impact, and Baseline Fatigue	326	60

ES.4 Impacts on Carriers

For representative carriers in each of several carrier size categories, the financial impact of each HOS rule option was estimated in terms of the change in net income (in 2004$) to the carrier,[1] as well as a change in their profits as a fraction of operating revenues. The approach used to estimate these impacts involved the development of a pro forma financial model of firms of different sizes confronted by changes in productivity, wages, and prices. Financial impacts of Options 2, 3, and 4 relative to Option 1 were estimated under two assumptions about prices of trucking services: unchanged prices (representing the short run), and prices after industry-wide cost changes have been passed through to consumers.

Relative to Option 1, all of the other options result in adverse financial impacts (reduced profits) on most carriers. The severity of the impacts is directly related to the magnitude of the drop in labor productivities considered for the three options. Option 2 revealed the least severe adverse impacts. Under Option 2, in the period before prices adjust, profitability as a share of revenue is projected to decrease by a tenth of one percent or less across all size classes, relative to Option 1. These impacts should be reduced slightly as prices adjust. Option 3 has the most severe impacts on carriers, and could eliminate net income in the short term for some industry size categories. Option 4 shows impacts that are in-between the two extremes.

[1] Representative carriers for the four largest size categories were selected on the basis of having the median value in the category for profitability (as measured by the ratio of net income to total revenue).

The results in terms of profit impacts relative to revenues under Option 2 seem to suggest very small impacts for firms across the wide range of size categories examined, including both large and small entities. The threshold for impacts considered to be of moderate size is generally taken to be one percent of revenues, and the average impacts of Option 2 fall well below that magnitude. It should also be noted that even though Option 2 would result in slightly lower profitability than Option 1, carriers would generally earn higher net revenues than they were under the pre-2003 rule, only a short time ago. Though variability in impacts within each size category means that the possibility of larger impacts for some small entities cannot be ruled out, the small magnitude of the total impact means that no more than a small percentage of entities could face significant impacts under Option 2.