

Appendix E – Estimate of Time Lost from the 2-night Provision for Restarts



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Appendix E – Estimate of the Time Lost from the 2-night Provision for Restarts

1. Introduction

This appendix contrasts two estimates of the weighted-average lost time per restart of the requirement that a restart break include 2 nights. One of these estimates, which corresponds to the requirement as specified in the Final Rule, requires that a driver be off-duty for two consecutive periods from 1:00 a.m. to 5:00 a.m. The other estimate was used for the NPRM, which defined the “night” for the purpose of the 2-night restart provision as midnight (12:00 a.m.) to 6:00 a.m.

Arriving at the estimate is a complex process. For a given restart, the critical variables are:

- The length of the restart break (i.e., the off-duty period of at least 34 consecutive hours that allows the driver to restart the cumulative tally of on-duty hours);
- Whether it covers 2 or 3 calendar days; and
- Times of day at which driver begins and ends the restart break.

Note that the last of these is a different variable from the length of the restart break. The effect of the 2-night provision on restart breaks of a given length will be different according to the times of day at the beginning and end of the restart break.

2. Length of Restart Break

The first consideration is the length of the restart break. If a break is 72 hours or longer, the driver does not need the restart provision to comply with the limit of 70 hours in eight days. Restart breaks are, therefore, limited to breaks of 34 to 71 hours.¹ Within that universe, many restart breaks are already compliant with the 2-night provision; drivers home for weekends with their families will usually spend two full nights at home before they go back to work. As a general principle, the longer a restart break is, the fewer cases there will be when it does not meet the 2-night restart provision. Any break of at least 52 hours is in compliance with the 1:00 a.m. to 5:00 a.m. provision.² From the 2007 FMCSA Field Survey [FMCSA (2007)], we know that 40.3 percent of breaks from 34 to 71 hours are 52 hours or longer.

2.1 2 CALENDAR DAYS OR 3 CALENDAR DAYS

It is the case that many breaks of fewer than 52 hours will happen to be compliant with the 2-night restart provision. It is possible, in fact, for the minimal restart break of 34 hours to include two 1:00 a.m.-to-5:00 a.m. periods. This is true if the break spans 3 calendar days. If, for example, a driver stops at 11:00 p.m. on Monday and resumes work at 9:00 a.m. on Wednesday, he will have a 34-hour break with two nights, as shown in Exhibit E-1.

¹ Strictly speaking, breaks of 34 to 71.75 hours. Our data report restart length by the quarter-hour.

² Even in the worst case of a restart break beginning at a minute after 1:00 a.m., so that the first night is an incomplete period from 1:00 a.m. to 5:00 a.m., a break that covers the next 52 hours will still encompass the next two periods from 1:00 a.m. to 5:00 a.m.

Exhibit E-1. Compliant with the 2-night Provision

MON Hours	TUE Hours	WED Hours	Total Hours
1	24	9	34

If the break covers only 2 calendar days, it can be compliant with the 1:00 a.m. to 5:00 a.m. provision, if, and only if, the driver stops work between midnight and 1:00 a.m. on Tuesday. In Exhibit E-2, the driver stops at 1:00 a.m. on Tuesday and is compliant. If he stops after 1:00 a.m. on Tuesday, he cannot be in compliance without going over to a third day.

Exhibit E-2. 2-day Case Compliant with the 2-night Provision

MON Hours	TUE Hours	WED Hours	Total Hours
0	23	11	34

Further, a break that does include 3 calendar days (all of one day and parts of two others) is not necessarily compliant. It is non-compliant if the driver starts working again before 5:00 a.m. on Wednesday as in Exhibit E-3.

Exhibit E-3. Not Compliant with the 2-night Provision

MON Hours	TUE Hours	WED Hours	Total Hours
10	24	4	38

If a break comprises all of 3 calendar days, the 2-night restart provision is met, but it is not relevant. That is a 72-hour break, and the driver can return to work without benefit of the restart provision.

From these simple examples, we see that there are two distinct cases to consider:

- The 2-day case—driver is now compliant with a break that comprises parts of 2 calendar days; and
- The 3-day case—driver is now compliant with a break that includes all of 1 calendar day and parts of 2 other calendar days.

As already noted, all 2-day restarts would be non-compliant, except for the case where the driver stops between 12:00 a.m. (midnight) and 1:00 a.m. on Tuesday. Any restart of 52 or more hours would be compliant. Any 3-day restart where the driver returns to work after 5:00 a.m. on Wednesday would be compliant.

It is clear that the 2-day restart is used by a driver who is pushing hard—a driver who wants to be working again almost as soon as the rule will allow. The driver using the 3-day restart may be home for a weekend or out on the road but preferring to get more rest (or not having an immediate opportunity for a load).

We do not have good data on the total number of restarts taken, but we do have useful data on the length of restart breaks. Almost all of the hard-pushing drivers will be over-the-road, for-hire, and truckload drivers. Restarts do not matter for local drivers, who usually have weekends off and will not often work more than 50 hours in a week. Almost all over-the-road, LTL drivers have weekends at home, giving them two nights off. Drivers in private carriage tend to run on regular schedules that give them weekends at home.

The 2007 FMCSA Field Survey [FMCSA (2007)] has usable data on length of 1,689 restart breaks for over-the-road, for-hire, and truckload drivers. There are 1,721 entries, but we found it necessary to discard some of them. There is a question about the number of drivers reporting restarts of exactly 34 hours. The relevant entries from the FMCSA 2007 Field Survey are in Exhibit E-4.

**Exhibit E-4. Number of Breaks by Length
from 2007 FMCSA Field Survey**

Length (Hours)	Entries
34.00	132
34.25	19
34.50	24
34.75	10
35.00	27

Compared to the subsequent entries, 132 for 34.00 hours seems excessive; some of these could be fake or erroneous entries. On the other hand, it is plausible that a disproportionate number of drivers, drivers who are pushing hard, might keep their restart breaks to the absolute minimum. Accordingly, we make a downward adjustment to 100 restart breaks in the interval 34.00-34.25 hours (which leaves 1,689 entries). This adjustment matters because it affects the average length of a 2-day restart break.

The data show restart breaks falling into two distinct sets: short and long breaks, roughly corresponding to the 2-day and 3-day cases. Forty-three percent of restart breaks are in the short set, concentrated in the range of 34 to 44 hours. There are two peaks in this range: 153 are below 35 hours and 70 are at 39 hours. Above 44 hours, the number of restart breaks for each hour of length drops considerably. There is a single peak—65 restart breaks that are 60 hours in length.

2.2 TIMES AT WHICH DRIVERS STOP WORK AND START WORK

The average length of a short or 2-day restart break is 38 hours; the average length of a long or 3-day restart break is 57 hours.³ Given the length of an average 2-day restart break, we can define the set of times of day for ending work to begin a restart break that are consistent with now-compliant 2-day restart breaks. Once this set of times is known, we can estimate the cost increment of meeting the 2-night restart provision, given a now-compliant 2-day restart break. The cost increment of meeting the 2-night restart provision, given a now-compliant 3-day restart break, can be estimated with the range of start-work times.

³ Calculated from 2007 FMCSA Field Survey data.

It is first necessary to explain the way in which the data have been analyzed. In the 2005 FMCSA Field Survey results [FMCSA (2005)], end times and start times are recorded in 15-minute increments—e.g., 1:00, 1:15, 1:30, and 1:45. For end times, we have treated an even hour, e.g., 1:00, as the mid-point of a range over the previous and following half hours. The number of end times shown for 1:00 a.m. is the sum of the entries for 12:30 a.m. through 1:15 a.m. Put another way, it is the entries from 12:30 a.m. up to, but not including, the entries for 1:30 a.m. In effect, we take the mid-point of the range as an approximation of the average for the range.

Thus, when we say a driver stops at 2:00 a.m., he is stopping anywhere between 1:30 a.m. and 2:30 a.m. This avoids a downward bias in the estimate of time lost when shifting backwards. If we said a driver stopping anywhere from 2:00 a.m. to 3:00 a.m. was stopping at 2:00 a.m., and counted the cost as 1 hour for going back before 1:00 a.m., we would undercount the time lost.

For start times at the end of the restart break, we count a start between 1:00 a.m. and 2:00 a.m. as a start at 1:00 a.m. This puts a slight upward bias in the accounting of time lost by going forward to a later start time.

3. Analysis of the 2-day Case

Given the 38-hour average for the 2-day case, a now-compliant driver must end work before 10:00 a.m. on the first day of the restart break (Tuesday in our example). If he ends work after 10:00 a.m., there are not 38 hours left in the 2-day period. Therefore, the end time must be in the range 1:00 a.m. to 10:00 a.m. In most cases, though not all, the least-cost way to meet the 2-night restart provision would be for the driver to stop before 1:00 a.m. on Tuesday. As the time cost of going back before 1:00 a.m. increases, however, the time cost of going forward and starting at 5:00 a.m. on Thursday decreases. We need to find the point at which the driver loses fewer hours by going forward to a later start time.

To calculate the cost of going forward in time, it is necessary to have a start-work time associated with each end-work time. We can do this using the finding that the average 2-day restart lasts for 38 hours. Calculation of the start time for each end time is best done using a 24-hour clock (which runs from 0000 to 2400 instead of 12 midnight to 12 midnight). We add 3800 hours to the end-work time and then subtract 2400 to bring the answer down to the start-work time the next day.

Start-work time = end-work time + 3800 - 2400.

Start-work time = end-work time + 1400.

For example, if end-work time on Tuesday is 0800, start-work time on Wednesday is 2200. (The restart break is 16 hours on Tuesday plus 22 hours on Wednesday.) Then, given work starting at 2200 on Wednesday, it would cost a driver 7 hours to move forward to a 0500 start on Thursday. Exhibit E-5 shows the analysis of hours lost by going back to end work before 1:00 a.m. on Tuesday or going forward to start work on Thursday after 5:00 a.m.

Exhibit E-5. Now-compliant 2-day Restart with Driver Stopping on Tuesday

End Time Tuesday	Hours Lost Going Back	Start Time Wednesday	Hours Lost Going Ahead to 0500 on Thursday	Least Hours Lost
0100	0.25	1500	14	0.25
0200	1	1600	13	1
0300	2	1700	12	2
0400	3	1800	11	3
0500	4	1900	10	4
0600	5	2000	9	5
0700	6	2100	8	6
0800	7	2200	7	7
0900	8	2300	6	6

For the 9:00 a.m. (0900) end time, the driver loses 6 hours by going forward to 5:00 a.m. on Thursday and 8 hours by going back before 1:00 a.m. on Tuesday. The hours lost by the least-cost choice for each end time are in the last column; it is these lost hours that are used to estimate the cost of the 2-night restart provision for the 2-day case.

There are two time intervals which are not whole hours—the ones associated with the first end-work time and the last end-work time. The first end-work time is where a driver stops between 1:00 a.m. and 1:30 a.m. In the analysis above, this is the 0100 end-work time. Time lost for the now-compliant driver stopping in this interval and forced to move back before 1:00 a.m. is counted as 0.25 hour. We assume the driver will move his stop time back no further than he has to.

The last end-work time in the analysis above is 0900. We treat this as 1.5 hours, the entries from 8:30 a.m. to 9:45 a.m.—the entries up to, but not including, the entries for 10:00 a.m. For drivers stopping between 8:30 and 9:30 a.m., the average time lost is 6 hours; these are the entries for 8:30, 8:45, 9:00, and 9:15. But, for drivers stopping between 9:30 a.m. and 10:00 a.m., the average time lost is 5.25 hours; these are the entries for 9:30 and 9:45. A driver stopping exactly at 9:30 a.m. on Tuesday starts at 11:30 p.m. on Wednesday and loses 5.5 hours by going forward to a 5:00 a.m. start on Thursday. If he ends work exactly at 10:00 a.m., he starts exactly at midnight and loses 5 hours by going forward to 5:00 a.m. on Thursday. Thus, the average loss for the drivers stopping in this half-hour interval is 5.25 hours. We adjust for this by multiplying the reported entries for 9:30 and 9:45 by the factor 5.25/6.

Exhibits E-6 and E-7, in which the dark spaces are time when the driver is in a restart break, provide graphic illustration of two of these cases.

Exhibit E-6. 38-hour Restart
(Driver now stops at 7:00 a.m. on Tuesday and backs up to before 1:00 a.m. on Tuesday—cost: 6 hours)

Non-compliant					Compliant				
Time	Mon	Tue	Wed	Thurs	Time	Mon	Tue	Wed	Thurs
12:00 a.m.					12:00 a.m.				
1:00 a.m.					1:00 a.m.				
2:00 a.m.					2:00 a.m.				
3:00 a.m.					3:00 a.m.				
4:00 a.m.					4:00 a.m.				
5:00 a.m.					5:00 a.m.				
6:00 a.m.					6:00 a.m.				
7:00 a.m.					7:00 a.m.				
8:00 a.m.					8:00 a.m.				
9:00 a.m.					9:00 a.m.				
10:00 a.m.					10:00 a.m.				
11:00 a.m.					11:00 a.m.				
12:00 p.m.					12:00 p.m.				
1:00 p.m.					1:00 p.m.				
2:00 p.m.					2:00 p.m.				
3:00 p.m.					3:00 p.m.				
4:00 p.m.					4:00 p.m.				
5:00 p.m.					5:00 p.m.				
6:00 p.m.					6:00 p.m.				
7:00 p.m.					7:00 p.m.				
8:00 p.m.					8:00 p.m.				
9:00 p.m.					9:00 p.m.				
10:00 p.m.					10:00 p.m.				
11:00 p.m.					11:00 p.m.				

In Exhibit E-6, the 12:00 a.m. cell in the compliant case is only partially filled in to make the point that a driver would not go all the way back to midnight on Monday in order to comply. As noted before, the rounding-off procedure does not include part of this hour in the estimate, except in the case of the driver stopping between 1:00 a.m. and 1:30 a.m.

Exhibit E-7 shows the case where a driver now starts at 11:00 p.m. on Wednesday and attains compliance by moving forward to start at 5:00 a.m. on Thursday.

Exhibit E-7. 38-hour Restart Break
(Driver now starts at 11:00 p.m. on Wednesday and goes forward to 5:00 a.m. on Thursday—cost: 6 hours)

Non-compliant					Compliant				
Time	Mon	Tue	Wed	Thurs	Time	Mon	Tue	Wed	Thurs
12:00 a.m.					12:00 a.m.				
1:00 a.m.					1:00 a.m.				
2:00 a.m.					2:00 a.m.				
3:00 a.m.					3:00 a.m.				
4:00 a.m.					4:00 a.m.				
5:00 a.m.					5:00 a.m.				
6:00 a.m.					6:00 a.m.				
7:00 a.m.					7:00 a.m.				
8:00 a.m.					8:00 a.m.				
9:00 a.m.					9:00 a.m.				
10:00 a.m.					10:00 a.m.				
11:00 a.m.					11:00 a.m.				
12:00 p.m.					12:00 p.m.				
1:00 p.m.					1:00 p.m.				
2:00 p.m.					2:00 p.m.				
3:00 p.m.					3:00 p.m.				
4:00 p.m.					4:00 p.m.				
5:00 p.m.					5:00 p.m.				
6:00 p.m.					6:00 p.m.				
7:00 p.m.					7:00 p.m.				
8:00 p.m.					8:00 p.m.				
9:00 p.m.					9:00 p.m.				
10:00 p.m.					10:00 p.m.				
11:00 p.m.					11:00 p.m.				

4. Analysis of the 3-day Case

The 3-day case (shown in Exhibit E-8) presents a much simpler analytical issue. As already noted, non-compliance with the 2-night restart provision occurs only when the driver starts before 5:00 a.m. on the third day. Since there are 3 calendar days, some part of Monday must be included and all of Tuesday. Thus, he has a night off for the Monday/Tuesday night. The issue turns on when he starts work on Wednesday. If he starts work again before 5:00 a.m. on Wednesday he is out of compliance. Since compliance can be achieved only by moving the start time forward, the question of whether the driver goes forward or back in time does not exist. So the case can be analyzed with attention confined to the start time on Thursday morning.

Exhibit E-8. 3-day Restart Break
(Driver now starts work at 4:00 a.m. on Thursday and moves forward to start at 5:00 a.m.—cost: 1 hour)

Non-compliant				Compliant			
Time	Tue	Wed	Thurs	Time	Tue	Wed	Thurs
12:00 a.m.				12:00 a.m.			
1:00 a.m.				1:00 a.m.			
2:00 a.m.				2:00 a.m.			
3:00 a.m.				3:00 a.m.			
4:00 a.m.				4:00 a.m.			
5:00 a.m.				5:00 a.m.			
6:00 a.m.				6:00 a.m.			
7:00 a.m.				7:00 a.m.			
8:00 a.m.				8:00 a.m.			
9:00 a.m.				9:00 a.m.			
10:00 a.m.				10:00 a.m.			
11:00 a.m.				11:00 a.m.			
12:00 p.m.				12:00 p.m.			
1:00 p.m.				1:00 p.m.			
2:00 p.m.				2:00 p.m.			
3:00 p.m.				3:00 p.m.			
4:00 p.m.				4:00 p.m.			
5:00 p.m.				5:00 p.m.			
6:00 p.m.				6:00 p.m.			
7:00 p.m.				7:00 p.m.			
8:00 p.m.				8:00 p.m.			
9:00 p.m.				9:00 p.m.			
10:00 p.m.				10:00 p.m.			
11:00 p.m.				11:00 p.m.			

5. Developing the Estimates

5.1 THE 2-DAY CASE

To estimate time lost per restart in the 2-day case, we need the percentage of drivers that stop in the end times from 1:00 a.m. to 9:00 a.m. (For the 3-day case, we need the percentage of drivers that resume work in the start times from 12:00 a.m. to 5:00 a.m.) For this purpose, we rely on data from the FMCSA 2005 Field Survey [FMCSA (2005)] on times when drivers stop work and times when they start work.

As noted above, we adjust the number of drivers counted as stopping in the 9:30 a.m.-10:00 a.m. period. This is done by reducing the number of drivers stopping in the last half-hour by multiplying by a factor of 5.25/6 or 0.875. The data show 74 drivers stopping in the 9:00 a.m. hour and 48 stopping between 9:30 and 10:00.

$$48 \times 0.875 = 42$$

We add 42 to 74 to obtain 116 drivers stopping in the 9:00 a.m. hour as defined. On the basis of the foregoing, we can now establish the percentages of drivers stopping in each hour in the 1:00 a.m. to 10:00 a.m. range and estimate the hours lost for the 2-day restart (presented in Exhibit E-9).

Exhibit E-9. 2-day Restart Break—Hours Lost

End Time	Hours Lost Per Driver	Percentage of Drivers	Adjusted Hours Lost
1:00 a.m.	0.25	1.0%	0.002
2:00 a.m.	1	2.0%	0.020
3:00 a.m.	2	1.5%	0.029
4:00 a.m.	3	1.8%	0.055
5:00 a.m.	4	1.8%	0.073
6:00 a.m.	5	2.9%	0.143
7:00 a.m.	6	3.1%	0.186
8:00 a.m.	7	2.4%	0.168
9:00 a.m.	6	3.6%	0.214
Totals		20.1%	0.891

For the average 2-day restart break, then, 0.891 hour is lost due to the 2-night restart provision.

5.2 THE 3-DAY CASE

For the 3-day case (presented in Exhibit E-10), we only look at start times on the third day (Thursday in our examples). Each hour is a full hour, 1:00 a.m. being 1:00-2:00, and so forth. A marked anomaly in the start-time data occurs with noon starts. The 2005 data show 404 entries for starts in the noon period, 125 for 11:00 a.m., and 119 for 1:00 p.m. Since the overall pattern is of starts peaking from 5:00 a.m. to 10:00 a.m., as one might expect, and declining thereafter, the 400-plus entries for noon cannot be accepted as valid. To fit the pattern in the rest of the data, we assign 124 entries for noon. There is also a minor issue for 12:00 a.m., the midnight to 1:00 a.m. period. The data show zero entries for this hour, but 54 entries for 11:00 p.m. and 54 entries for 1:00 a.m. The zero for 12:00 a.m. seems unlikely, so we assign a value of 24 for 12:00 a.m. On this basis, we can estimate the hours lost in the 3-day case.

Exhibit E-10. 3-day Restart Breaks—Hours Lost

Start Time	Hours Lost per Driver	Percentage of Drivers	Adjusted Hours Lost
12:00 a.m.	5	0.7%	0.037
1:00 a.m.	4	1.7%	0.066
2:00 a.m.	3	2.4%	0.071
3:00 a.m.	2	2.4%	0.048
4:00 a.m.	1	5.0%	0.050
Totals		12.2%	0.272

For the average 3-day restart break, 0.272 hour is lost due to the 2-night restart provision.

6. Combined Estimate of Cost for Average Restart under the Final Rule

To get the combined estimate, we weight the estimates for the two cases according to their share of all restarts. For this purpose, we can use data from the FMCSA 2007 Field Survey [FMCSA (2007)], which has data on lengths of restart breaks (shown in Exhibit E-11).

Exhibit E-11. Lengths of Restart Breaks from 2007 FMCSA Field Survey

Restart Breaks	Percentage
34 to 44 hours	43.0%
>44 to <72 hours	57.0%

$$0.43 \times 0.891 + 0.57 \times 0.272 = 0.538$$

The hours of work time lost due to the 2-night restart provision are 0.54 hour per average restart.

7. Estimate of Time Lost under the NPRM Restart Provision: 12:00 a.m.-6:00 a.m.

For the sake of comparison, it is useful to also make an estimate of time lost under the prior option: a “night” defined as 12:00 a.m.-6:00 a.m.

7.1 THE 2-DAY CASE 12:00 A.M.-6:00 A.M.

Under this option, no restart that includes only 2 calendar days can be compliant. A driver must either go back before midnight on Monday or forward to Thursday morning after 6:00 a.m. Exhibit E-12 presents the least hours lost for this option in the 2-day case. The first end time, 12:00 a.m., is the half-hour from 12:00 a.m. to 12:30 a.m., and the time cost to the driver of going back before midnight is 0.25 hour. The following table shows least hours lost for each end-work time.

Exhibit E-12. Now-compliant 2-day Restart Break with Driver Stopping on Tuesday (12:00 a.m.-6:00 a.m. Option)

End time Tuesday	Hours Lost Going Back to Monday	Start Time Wednesday	Hours Lost Going Ahead to 0600 on Thursday	Least Hours Lost
0000	0.25	1400	16	0.25
0100	1	1500	15	1
0200	2	1600	14	2
0300	3	1700	13	3
0400	4	1800	12	4
0500	5	1900	11	5
0600	6	2000	10	6
0700	7	2100	9	7
0800	8	2200	8	8
0900	9	2300	7	7

Before proceeding with the estimate of hours lost, we need to address an issue in the data on end-work times in the FMCSA 2005 Field Survey [FMCSA (2005)]. The data show a disproportionately large number of drivers stopping from midnight to 12:30 a.m. The data (presented in Exhibit E-13) show approximately 800 end times in this period followed by very few in the 12:30 a.m. to 1:00 a.m. period. This is out of about 4,000 entries for truckload, for-hire, and over-the-road carriers. For this reason, we did not use the entries for the midnight to 1:00 a.m. period, but, instead, interpolated from the entries on either side of this period, which show reasonable values. It is necessary to make separate estimates for 12:00 a.m. to 12:30 a.m. and for 12:30 a.m. to 1:00 a.m.

Exhibit E-13. Driver Stopping Times from 2005 FMCSA Field Survey Data

Period	Entries
11:00-11:30	56
11:30-12:00	27
12:00-12:30	29
12:30-1:00	30
1:00-1:30	32
1:30-2:00	23

Note: Estimated values in bold.

Accordingly, we use 29 as the number of drivers stopping in the first half-hour after midnight, designated as 12:00 a.m. in our system. We add the estimated 30 drivers stopping from 12:30 to 1:00 to the 32 from the data for 1:00 to 1:30 to obtain 62 drivers stopping from 12:30 to 1:30, designated as 1:00 a.m.

As with the 1:00 a.m.-5:00 a.m. requirement, the 9:00 a.m. end time is an interval of 1.5 hours: 8:30 to 10:00. The calculation for the adjustment of time lost in the last half-hour is different, however. For the requirement in the rule, the time lost is 6 hours for drivers in the 8:30-9:30 interval and 5.25 hours for the drivers in the 9:30-10:00 period. For the 12:00 a.m.-6:00 a.m. option, the time lost is 7 hours for drivers in the 8:30-9:30 interval and 6.25 hours for drivers in the 9:30-10:00 interval. So we adjust the number of drivers (48) in the 9:30 -10:00 interval by multiplying by a factor of $6.25/7 = 0.893$ —and add the result to the 74 entries in the 8:30-9:30 period.

$$0.893 \times 48 = 42.9$$

$$74 + 43 = 117$$

With this adjustment, the time lost in the 2-day case is estimated as shown in Exhibit E-14.

**Exhibit E-14. 2-day Restart Break—Hours Lost
(12:00 a.m.-6:00 a.m. Option)**

End Time	Hours Lost per Driver	Percentage of Drivers	Adjusted Hours Lost
12:00 a.m.	0.25	0.9%	0.002
1:00 a.m.	1	1.9%	0.019
2:00 a.m.	2	2.0%	0.041
3:00 a.m.	3	1.5%	0.044
4:00 a.m.	4	1.8%	0.074
5:00 a.m.	5	1.8%	0.091
6:00 a.m.	6	2.9%	0.171
7:00 a.m.	7	3.1%	0.217
8:00 a.m.	8	2.4%	0.192
9:00 a.m.	7	3.6%	0.252
Totals		21.9%	1.102

7.2 THE 3-DAY CASE 12:00 A.M.-6:00 A.M.

The only change from the provision in the Final Rule is that the range of start times is increased to 12:00 a.m.-5:00 a.m. (presented in Exhibit E-15). A driver starting after 6:00 a.m. is compliant.

**Exhibit E-15. 3-day Restart Break—Hours Lost
(12:00 a.m.-6:00 a.m. Option)**

Start Time	Hours Lost per Driver	Percentage of Drivers	Adjusted Hours Lost
12:00 a.m.	6	0.7%	0.044
1:00 a.m.	5	1.7%	0.083
2:00 a.m.	4	2.4%	0.095
3:00 a.m.	3	2.4%	0.072
4:00 a.m.	2	5.0%	0.101
5:00 a.m.	1	6.2%	0.062
Totals		18.4%	0.456

7.3 COMBINED ESTIMATE OF COST FOR AVERAGE RESTART UNDER THE 12:00 A.M.-6:00 A.M. OPTION

The 2-day restart breaks are 43.0 percent of the total, and the 3-day restart breaks are 57.0 percent of the total.

$$0.43 \times 1.102 + 0.57 \times 0.456 = 0.734$$

Thus, the average time lost per restart is 0.73 hour under the 12:00 a.m.-6:00 a.m. option. This average is notably higher than the 0.54 hour per restart lost under the requirement in the final rule. The difference is largely due to the shorter ranges of end-work and start-times that are affected by the rule as compared to the prior option.

8. References

Federal Motor Carrier Safety Administration, “FMCSA HOS Field Survey: Implementation and Use of the April 2003 Hours-of-Service Regulations,” (2005 FMCSA Field Survey), 2005. Available in the docket: FMCSA-2004-19608-2090.

Federal Motor Carrier Safety Administration, “2007 Hours of Service Study,” (2007 FMCSA Field Survey), 2007b. Available in the docket: FMCSA-2004-19608-2538.