



Cell phones continue to be cited as causing fires at the pump in e-mails circulating on the Internet. So far we have been unable to document any incidents that were sparked by a cellular telephone.

Fires at Refueling Sites That Appear To Be Static Related – Summary

March, 2010

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BACKGROUND/STATEMENT OF THE PROBLEM:

Until September, 1999, the only motor vehicle refueling fires that the Petroleum Equipment Institute (PEI) was aware of were caused either by an open flame (smoking), lack of electrical continuity between the nozzle and the gasoline dispenser, or a spark from the engine compartment of a vehicle with its motor running. From September 1999 through January 22, 2000, 36 ignitions of gasoline vapors during the refueling process were verbally reported to me at PEI. All occurred during dry weather. There were no open flames and the engines were off. Continuity was verified between the nozzle and dispenser. People that investigated the cause of these accidents concluded that static electricity was the source of ignition in all cases.

HOW PEI GOT INVOLVED:

Although Americans pump gasoline into their cars between 11 and 12 billion times a year without incident, the fact that these fires were occurring in the first place—and with what appeared to be greater frequency—caused PEI to gather additional information about the circumstances surrounding the fires. We carried an article (Document A) in the January 25, 2000, issue of PEI's newsletter (*TulsaLetter*), asking readers to report to us all refueling fires presumably caused by static electricity. The same article and request appeared on PEI's Web site (www.pei.org) on January 23, 2000. An on-line report form accompanied the newsletter on the Web site (Document B).

WHAT PEI ASKED:

The newsletter asked readers to identify the make, model and year of the vehicle, the type of fuel used, type of tires and driveway finish, customer action while refueling, and any other information they believed would be useful. We promised that no oil company or PEI member names would be divulged. All responses were strictly confidential.

INFORMATION PEI INITIALLY RECEIVED:

PEI received 47 first-hand reports of refueling fires attributed to static electricity in response to our request in the newsletter. We also obtained 34 Vehicle Owner's Questionnaires (VOQs) from the National Highway Traffic Safety Administration's (NHTSA) database which strongly suggested that static electricity was the source of ignition. The reported fires occurred between 1993 and April 1, 2000, with more than half occurring from 1999 through April 1, 2000. A detailed report, similar to the one that follows, was posted on PEI's web site in May 2000.

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INFORMATION PEI HAS RECEIVED THROUGH MARCH 2010:

PEI continued to receive reports of accidents/fires attributed to static electricity after we issued our report in May 2000, even though we did not actively solicit them in future newsletters. A detailed report listing all fires received and confirmed by PEI through March, 2010 contains the following information:

- Reports by Year
- Reports by Month
- Reports by State
- Injuries
- Damage to Station
- Damage to Vehicle

One hundred seventy-six reports (first-hand and NHTSA's VOQs) have been received from 39 states and Washington, D.C. In all the reports we were able to verify that no open flames, running motors, or electrical continuity problems were involved. The accidents occurred with conventional and vacuum-assist Stage II vapor recovery nozzles. There have been no accidents reported to PEI when balance system nozzles were used. Driveway surfaces included concrete, asphalt, stone, crushed rock and dirt. Fires occurred with many different types of nozzles, hoses, breakaways and dispensers. No cell phones were involved. A wide variety of clothes were worn by the refuelers. Rubber-soled shoes were worn by the refuelers in 94% of the accidents where footwear was identified. A summary of all the fire reports is also included in Document D.

WHY DOES THIS HAPPEN?

The author of this report is not an expert on static electricity. It does appear to many people in the industry, however, that electrostatic charging was the probable cause of the fires. In many of the reports we received, the refueler became charged prior to or during the refueling process through friction between clothing and the car seat to such an extent that electrostatic discharges to the vehicle body, fuel cap or dispensing nozzle occurred. Eighty-seven (87) fires occurred when the fueler returned to the vehicle during the refueling process and then touched the nozzle after leaving the vehicle. Thirty-nine (39) reports described fires before the refueling process began, when the fueler touched the gas cap or the area close to it after leaving the vehicle. Thirty (32) fires do not involve either of these two fact situations. In all but two of these cases the fueler was not the source of the electrical discharge and the source of ignition cannot easily be determined. We received insufficient information on seventeen (17) fires reported by NHTSA to confidently categorize them.

PEI has received five excellent articles (Documents E, 1-5) written over the last six years which attempt to explain these types of fires. Most were written in response to similar refueling fires in Germany, the United Kingdom and France from 1992 through 1997. Some offer very detailed explanations about why these refueling fires occur.

INFORMATION PEI DOESN'T HAVE:

Forty-five (45) fires have been verbally reported to us, but no written reports have been submitted. As a consequence, these 45 fires were not included in our report. The American Petroleum Institute (API) conducted a survey similar to PEI's in 2000 and identified 54 fires attributed to static electricity, most of which did not overlap with those collected by PEI. API's information is also not included in this report. API's February 2, 2000, report form (Document C) and its February 3, 2000, Consumer Advisory (Document F-5) are available from PEI.

RESPONSES:

Warnings have been issued by various companies and organizations since November 1999 (Documents F, 1-6).

WHERE DO WE GO FROM HERE?

PEI will continue to collect reports of fires, as well as theories and studies about why these fires happen. To contact the author of this report, refer to the numbers listed on the first page.

PEI and API joined together September 23, 2002, to remind motorists how to avoid potential problems with static electricity at the gas pump (Document G). The groups also listed tips on how motorists can follow safe refueling practices (Document H).

OTHER INFORMATION:

Information referenced throughout this summary is identified below. It is not included with this report because of the number of pages involved. We will mail a full set upon request. Contact PEI at the numbers listed on the first page for a copy of the referenced documents.

REFERENCED DOCUMENTS

- A. PEI *TulsaLetter* – January 25, 2000
- B. PEI Report Form – January 23, 2000
- C. API Report Form – February 2, 2000
- D. Summary of Fire Reports
- E. Articles
 - 1) German DGMK Project 508 – February 1996
 - 2) Guidelines for the Control of Hazards Arising from Static Electricity – The Institute of Petroleum, London – March 1998
 - 3) Electrostatic Ignitions of Fires and Explosions, Thomas H. Pratt, Burgoyne Inc., Marietta, Georgia (1997)
 - 4) Report on Refueling Ignitions on Petrol Filling Stations in Europe – The Bulletin, Volume 35, August 1997
 - 5) The Role of Static Electricity In Forecourt Fires In Europe – The Bulletin, Volume 38, February 2000
- F. Warnings
 - 1) Oil Company Alert: Static Electricity Discharge Explosion Hazards – November 24, 1999
 - 2) Motor Vehicle Fueling Fires - Nebraska State Fire Marshal's Office – January 2000
 - 3) BP Amoco Press Release – January 24, 2000
 - 4) Flash Fire Alert – Alaska Army National Guard – February 2000
 - 5) Gasoline Refueling Advisory and Safety Guidelines for Consumers – API – February 3, 2000
 - 6) Three petroleum marketer warnings issued January-March 2000
- G. PEI/API Joint Press Release (September 23, 2002)
- H. Safe Refueling and Fuel Handling Guidelines for Consumers (September 23, 2002)

Fires at Refueling Sites that Appear to be Static Related—The Incidents—March 2010

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- Reports by **Year**
- Reports by **Month**
- Reports by **State**
- Report of **Injuries**
- Damage to **Vehicle**
- Damage to **Station**
- Incidents reported to **PEI**
- Incidents reported via **NHTSA Questionnaire**

Reports by Year

Year	Total	NHTSA Only
1992	1	
1993	1	1
1994	3	3
1995	8	7
1996	7	4
1998	10	3
1999	32	6
2000	24	1
2001	12	
2002	31	
2003	12	
2004	5	
2005	3	
2006	5	
2007	1	
2008	2	
2009	2	
2010	1	
Unknown	7	4
Total	176	34

Reports by Months

Month	Reports	Percent %
January	30	18
February	27	14
March	21	12
April	11	6
May	10	7
June	4	1
July	1	1
August	7	2
September	7	2
October	8	2
November	16	7
December	27	17
Unknown	7	7
Total	176	96%

Reports by State

State	Total	NHTSA Only
Nebraska	14	1
Texas	11	2
Colorado	10	3
Missouri	10	
Kentucky	9	
Pennsylvania	8	3
California	7	4
North Carolina	7	1
Oklahoma	6	
Kansas	6	
Michigan	6	1
Illinois	6	2
Virginia	6	
Minnesota	5	2
Tennessee	5	1
Louisiana	4	1
New Mexico	4	
Arizona	4	
Utah	4	
Ohio	4	1
Idaho	3	1
New York	3	2
Washington	3	
Maryland	2	2
Georgia	2	2
Wisconsin	2	1
Mississippi	2	
South Carolina	2	
Massachusetts	2	1
Montana	3	
Arkansas	2	1
Alabama	2	
Alaska	2	
Indiana	1	
Iowa	1	
District of Columbia	1	1
Florida	1	
Nevada	1	
New Jersey	1	
Oregon	1	
Canada	1	
Unknown	2	
Total	176	34

Injuries

Number	Description of Injury
26	Hair singed/Burned
8	First and Second degree burns
7	Burns to hand
4	Yes
5	First-degree burns
2	Burns to leg—treated and released
3	Burns to face
3	Second-degree burns—skin grafts
3	Badly burned
2	Minor scrapes
2	Clothing scorched
2	Treated for burns—released
1	Third-degree burns over 60% of body
1	Death-person
1	Death- Inhalation of heated gas fumes
1	Death—Dog
1	Back injury
1	Bruised leg from running away
1	Nerve damage

Damage to Vehicle

Number	Description of Damage
36	Totaled
15	Paint discolored; blistered
20	Under \$1,000; minor
9	Melting around fill pipe
9	\$1,000 to \$8,000; moderate
4	Yes
2	Smoke
1	Burned rubber around gas tank door

Damage To Station

13	Damage to dispenser
10	Destroyed nozzle
10	Destroyed dispenser
8	Destroyed dispenser(s) and canopy
4	Destroyed canopy
3	Aboveground storage tank destroyed
2	Destroyed garage and nearby buildings
1	Nozzle splash guard
1	Destroyed dispenser(s), canopy, lighting
1	Smoke damage to cover above pump
1	Smashed fire extinguisher housing
1	Damage to fuel hose and canopy
1	Damage to gas tank and right quarter panel
1	Estimated \$40,000

The Incidents - Details

87 Fires Reported to PEI Where the Vehicle Was Re-entered and the Nozzle was Touched During Refueling

Log #	Date	Yr./Make Vehicle	Description of Incident
1	10-99	Toyota Camry	The customer started fueling. She put it on automatic and returned to sit in the car. The nozzle shut off. She topped off the tank. As she grabbed the nozzle to remove it, a flash fire occurred.
2	1-00	1991 Plymouth Voyager	Started fueling the car with the automatic nozzle set. She reentered the car leaving the door open. She returned to the nozzle in order to stop the pump at the amount she wanted. After shutting off the nozzle manually she started to remove the nozzle; a fire started at the filler pipe of the car. When the fire started she removed the nozzle and threw it to the ground.
3	12-99	Mitsubishi Eclipse	Started fueling. Returned to car to write a check. Returned to the fueling site to stop fueling at \$7.00. When she touched the nozzle, a flash fire followed.
4	12-99	1999 Ford Windstar	I shut off my engine before refueling my van. I got out of my van and began fueling. I set the pump to operate automatically while I sat in my car for a few minutes. While waiting in my car I called my husband on the cell phone and shut the phone off. After the pump had a little over \$10 worth of gas, I grabbed a \$20 bill and got out of the van to shut the gas off and pay. I got out and proceeded to pull the nozzle out of my vehicle. When I pulled the nozzle from my tank, a burst of flames shot out of my tank with the nozzle on fire. I jammed the nozzle back into the tank and ran from the vehicle.
6	1-00	1995 Mitsubishi Eclipse	I was letting it fill up and I got out of the car to go to stop the gas and when I reached down I felt a pop on my finger and I pulled back and the flames came up.
9	1-00	1995 Plymouth Voyager	Driver gets out of car to fuel. Returns to car. Dispenses \$9 and gets out of car. Shuts door. Touches nozzle. Fire. Driver goes into store. Latch still on. Yanks the nozzle out to put out the fire. Gasoline comes out.
11	3-99	1996 Nissan Quest	Started dispensing fuel, got back in van, left door open. Jumped out to stop fueling and a static spark ignited the vapors as he reached for the nozzle.
12	Unknown	1999 Chevy Van	Started fueling. Got back in van. Got back out. Spark from hand to nozzle ignited vapors.
13	10-99	1997 Buick Regal	Operator was wearing cotton gloves. Started fueling and sat back in car waiting for nozzle to trip. Reached for nozzle after 11 gallons were dispensed. Flame came out. Turned off nozzle and dropped it on the ground. Attendant put out fire at fuel port.

Log #	Date	Yr./Make Vehicle	Description of Incident
15	1-00	1999 Ford F150 Pickup	Started fueling, went back to car, turned on power to view fuel gauge, turned off power. Left vehicle with door open. Touched nozzle and felt spark.
16	1-00	1992 Ford F150 Pickup	Engine on while refueling. Blocked nozzle open to "on" position with a rock. Climbed back into vehicle. Gauge at $\frac{3}{4}$ full, reached for nozzle to stop fuel flow, and saw flame shoot out from tank spout. Fire marshal said "a static discharge occurred."
18	5-99	Unknown	Customer sat in car while refueling. Turned key on to auxiliary. As the nozzle was pulled out, saw a flame.
19	3-97	1985 Buick Park Avenue	Chocked the nozzle open with the gas cap. Went into the car to talk to the children. Heard tank filling to top, got out of car, reached for the nozzle to turn off fuel flow. Sparking occurred at the nozzle-vehicle fill connection.
21	10-97	1985 Buick station wagon	After four gallons were dispensed, the driver opened the driver's side door, got in car and turned key to observe the gauge. She got out of the car, leaving the door open. She touched the nozzle to put more gas in her car and felt her hand getting hot. She looked down and saw fire coming from the fill spout of the gas tank. She jerked back and pulled the nozzle out, spraying some gasoline in (the door was open) and on the car. 7.28 gallons dispensed.
23	1-96	1996 Camaro	Put nozzle in car. Returned to car. Went back to nozzle. Bent down behind nozzle. Flash. Ran away but returned to car to remove nozzle.
25	1-99	1997 Chevy Silverado	Driver blocked nozzle open with gasoline cap. Sat in driver's seat with driver's side door open. Went back to nozzle as tank became full, touched the nozzle and vapors ignited. Started to run away but returned to remove nozzle and dropped it on the ground.
26	2-99	1993 Olds Cutlass Supreme	Started fueling. Sat back in car to return gas card to purse. Returned to rear of car to hold nozzle. Fire flared up as she reached for the nozzle.
29	11-99	1990 Nissan XS	Nozzle in car. Latch-open device on. Punched in I.D.# on card system. Sat in car with door open with one foot on the ground. Reached for nozzle to disengage, and saw a spark, flash and flame from filler neck. Removed nozzle and threw it down. Pushed car away.
30	1-98	1997 Ford Crown Victoria	Started fueling. Sat back in car. Nozzle clicked off. Touched nozzle to remove it. Flash fire.
32	1-99	1991 Chevy Lumina	Driver turned off ignition, turned on pump and began to refuel. She then opened the driver's side door and entered the car. Turned ignition switch to "on" (engine off) and watched the gas gauge. Got out of car and touched the nozzle to shut it off. Flames erupted.

Log #	Date	Yr./Make Vehicle	Description of Incident
36	12-99	Ford Pickup	Driver pulled up to an MPD, cleared the dispenser and placed the nozzle in the fuel tank. He was going to put \$5 in the vehicle so he reentered the driver's seat and closed the door while the fueling was in operation. When the dispenser was at \$4, he opened the door on the pickup, stepped down to get out, and reached back to touch the nozzle. When he touched the nozzle there was a flash fire.
72	1-00	1999 Ford Pickup	Owner put nozzle in fuel tank and began fueling. As he got back in the truck, he touched the door and got a shock. He got out of the truck while it was still pumping (he wanted \$20), touched the nozzle and a fire resulted.
73	12-99	1994 Mitsubishi	Turned on accessory. Filled to \$19 and nozzle clicked off. Got out of car, touched the nozzle (never the car), and it flashed. Dropped nozzle on ground.
75	2-99	1993 Ford Probe	Pumping gas. Set auto fill. Got in car to get keys. Reached for nozzle to top off car and fire resulted. Car was almost full of gasoline.
76	2-99	1993 Dodge Caravan	Driver started fueling and got back in car. Nozzle shut off. As she touched the nozzle, she felt a shock and fire ensued.
78	2-00	1997 Honda Accord	Lady drove in, started fueling, reentered car, got out of car, closed door, touched nozzle with right hand. Flash.
81	Unknown	1999 Dodge Durango	Started fueling. Got back into vehicle. Got back out, reached for nozzle and a spark jumped from hand to nozzle, igniting the vapors.
84	4-00	1995 Ford Windstar	Fueling van on automatic. Driver reentered van to talk to a friend. Opened door and doesn't remember if she shut it. Touched nozzle—or got close to it. Fire out fill neck. Turned off dispenser and ran to station to get extinguisher to put out flames.
88	3-00	2000 Chrysler Town & Country LX	Started fueling and left latch-open device on. Returned to van to get money. Shut door by grabbing window frame. Stood watching meter and touched nozzle. Flame went up left hand and continued for at least a minute. Shot out like a torch.
89	12-99	1998 Ford Mustang	Driver got out of vehicle, engine running, nozzle inserted. Walked back to vehicle to sit down. Left door open. Driver thought nozzle clicked off. Got out of vehicle. Two inches from nozzle saw a spark.
90	8-00	1995 Ford Escort	Turned off engine and exited vehicle, leaving door open. Removed nozzle from pump and placed in tank. Re-entered car to place credit card into wallet. Exited car to remove nozzle. Reached for nozzle. Entire nozzle was engulfed in flames. Fire followed hose to the dispenser.
91	4-92	1992 Chrysler Van	Fueling car. Sat in car as tank filled. Got out and reached for nozzle. Flash fire occurred, burning car and area on the ground around it.

Log #	Date	Yr./Make Vehicle	Description of Incident
93	11-99	2001 Chevy S-10	Began fueling. Returned to car to put credit card away. Got back out. As hand got close to the pump, heard the fire ignite. Fire burned hair and eyelashes.
99	8-01	1995 Chevy Lumina	Fueler set auto nozzle latch open. Entered back seat to see about baby buckled in car seat. While attempting to remove nozzle from tank blaze occurred at nozzle area.
100	9-01	1999 Dodge Durango	Put nozzle in vehicle and set for self-fill. Returned to vehicle to write check. While grabbing handle to remove nozzle, flames shot out and up the side of car.
103	2-02	1996 Z71 Chevrolet	Driver unscrewed gas cap and put nozzle into tank. Got back into vehicle to put credit card away. Got out and attempted to touch the nozzle. Saw a large spark come out of the gas tank, fire ignited - it was a huge burst of flames.
104	3-02	1991 GMC Safari Van	Started fueling. Got back into vehicle to write a check. Got back out to manually finish pumping fuel. Left door open to hear two young children in vehicle. As soon as I grabbed nozzle flames were all around me.
105	3-02	1994 Geo Tracker	Driver started fueling on auto-cut-off. During fueling at passenger side rear of vehicle, he returned to driver's side, entered car and returned without closing door to fueling side. When he removed nozzle from tank a fire ball erupted.
106	3-02	2001 Nissan Pathfinder	Driver got back into car to put something away. Got out to stop pump from fueling. Driver felt a shock and a whoosh sound. Flames were coming out of gas tank.
107	6-02	1996 Toyota Corolla	Started pumping gas. Got back into car because it was cold. Got out of car, reached for handle and felt a buzz. Saw a spark and a fire ignited at the entrance to the fuel line.
110	10-99	1995 Chevy ½ ton	Sitting inside vehicle while fueling. Stepped out of truck and immediately grabbed for handle to take out of tank. Fire shot out of gas tank.
113	8-01	Nissan Pathfinder Van	When fueling vehicle driver sat down in vehicle. When dispenser clicked off he returned to dispensing nozzle. Driver grabbed nozzle, felt static go up arm. Fire started coming out of fill hole by nozzle.
114	1-02	Not known	Driver started fueling and returned to vehicle. After fueling, she pulled nozzle out of car and fire started.
115	5-02	1987 Pontiac Firebird	Customer entered store to prepay for fuel. Driver returned to vehicle, put nozzle in tank and set auto-clip. She returned to vehicle, sat down in driver's seat and left door open. As she went to remove nozzle there was a flash.
116	2-02	1999 Chevrolet Venture	Driver put gas in van and returned to vehicle because it was cold. As she pulled nozzle out, flames shot out of tank on to van, nozzle and ground.

Log#	Date	Yr./Make Vehicle	Description of Incident
117	11-00	1993 Subaru Legacy	Driver began filling tank and then engaged hold-open clip. She returned to car to put away debit card and then grabbed nozzle to disengage clip and continue filling. Driver felt a static spark as she grabbed nozzle and heard "whoosh" sound as fumes ignited.
118	10-99	Honda	Driver pumped gas, sat in car because it was cold, touched nozzle to release automatic and felt spark and saw flames.
120	1-02	1997 Ford F150	Customer paid clerk \$20. Started nozzle pumping and got back into truck because it was cold. She noticed pump had passed \$20 and jumped out to grab nozzle to stop gas. Vapors burst in a big fireball.
121	3-99	1991 Olds. Silhouette	Driver put nozzle in tank and set auto-fill. She returned to van to write a check and get out of cold and wind. Driver reached down to remove nozzle, saw a spark and fire came out of tank.
122	4-02	1994 Nissan Altima	Driver set nozzle to self-pump and returned to car. When fueling was complete driver returned to pull nozzle from tank. Flash of fire occurred around opening of gas tank.
127	3-01	1988 Chevy S-10	Customer sitting in vehicle during refueling process. When fueling complete, he exited vehicle and returned to nozzle. Felt shock when touching the pump. Truck caught fire.
131	9-02	1972 Chevrolet P/U	The victim was with a friend and both were filling their vehicles at the same time after a trip. He began filling his vehicle and walked to his friend's pickup at the next pump. He had agreed to pay for the gas in the pickup. The owner of the pickup placed the nozzle in the fill opening located behind the driver's door. He then stepped back from the vehicle. The victim stood in the open doorway of the driver's side and reached in to retrieve his wallet. He had his wallet in the palm of his left hand as he placed his hand on the truck's fabric seat cover. He then touched the cab of the truck close to the fill opening. He heard a "whoosh" sound as the fire occurred.
133	1-98	1995 Toyota 4-Runner	Driver began fueling and returned to driver's seat. Automatic shutoff had not occurred yet when he exited the vehicle. Reached for nozzle and static discharge occurred. Vapors ignited.
134	10-02	1992 Dodge Caravan	Customer started the fueling process and then got back inside the vehicle and sat down in the seat. Driver then got out of the vehicle and reached for the nozzle. Vapors around her ignited, catching the vehicle on fire.
135	10-02	2001 Chevy Tahoe	Owner of a private fuel tank began fueling vehicle. Returned to front seat to log mileage. Returned to rear of vehicle to remove nozzle. As owner reached for the nozzle the gasoline fumes ignited totaling vehicle, tank, stand, hose and nozzle.

Log#	Date	Yr./Make Vehicle	Description of Incident
136	10-02	Plymouth Voyager	Driver started fueling process and returned to vehicle. Driver returned to manually finish fueling vehicle. Fire started.
138	5-19-01	1992 Olds Cutlass	Driver activated nozzle and used hold-open device. Returned to driver's seat with door open. Driver exited vehicle and touched nozzle. Felt shock on hand and saw fire from nozzle.
139	4-02	1997 Buick 4-door	Driver left ignition turned to accessory, exited vehicle, inserted nozzle into fill pipe and put gas cap in handle to keep gas flowing. Went to driver position to watch gauge. Exited vehicle to return to fuel area. Flames erupted.
141	11-02	1998 Chevy Suburban	Driver began fueling. Placed nozzle on automatic. Returned to car. Reached for nozzle to stop fueling and fire erupted.
144	12-02	1997 Jeep Wrangler	Driver got into car after pumping gas. He returned when pump shut off and touched the dispenser. A small fire erupted.
145	12-02	2000 Mitsubishi Eclipse	Motorist began fueling and then reentered vehicle front seat. Driver exited vehicle and proceeded to rear of car. When she reached filler spout with hose in it, she leaned over to listen to see if fuel was flowing into the fuel tank. There was an instantaneous flash fire.
146	12-02	2000 Toyota 4-Runner	Driver started pumping gas and went back inside the vehicle. Driver exited vehicle and touched nozzle. Fire started.
147	12-02	Dodge Caravan	Driver started pumping gas and returned to vehicle. When pump showed almost \$10 driver jumped out and grabbed nozzle. Spark occurred and fire erupted from tank fill port.
148	1-03	1991 Subaru Legacy	Customer began filling car with gas. Got back in car, got out and grabbed nozzle, felt shock and saw flames.
149	1-03	1990 Cadillac Eldorado	Gasoline station attendant put hose in gas tank and proceeded to fill the tank. Customer upset because cap was placed on top of trunk of vintage Cadillac, got out of car to remove it and place it on the door to the gas tank. When driver placed the cap on the door cover, he felt a shock which produced flames at the fill pipe.
151	1-03	1994 Ford Escort Wagon	Customer's niece started fueling vehicle. She got back into car. When nozzle clicked off she got out of car and touched the nozzle. She saw a spark and fire started.
152	11-00	1997 Buick LeSabre	Driver sat down in car while fueling vehicle. Driver then touched nozzle while fuel was still dispensing. Fumes ignited.
154	4-03	1996 Dodge Gr. Caravan	Driver started fueling, got back in car, got out, touched nozzle to remove. Flames.
156	12-01	1997 Chevy Van	The driver exited the car, began fueling and returned to vehicle due to cold weather. Driver exited for the second time and removed the gas nozzle after filling up. The spark from her hand to the nozzle started the fire.

Log#	Date	Yr./Make Vehicle	Description of Incident
157	10-98	1996 Chevy Pickup	Driver inserted hose to begin fueling. Driver returned to sit on seat with door open and legs resting on running boards. When gauge approached full, driver stepped out and attempted to pull nozzle out. Static popped off fingers and a ring of flames formed around nozzle.
159	11-03	2000 Nissan Pathfinder	Driver fueling car. Returned to vehicle because it was cold. When fueling was finished driver exited car and touched nozzle. Nozzle sparked and a fire ball occurred.
160	11-03	2003 Ford Expedition	Driver started fueling, got back in vehicle, got out to remove nozzle, flash fire occurred.
162	1-04	SUV	While driver inside vehicle, the nozzle overflowed. Driver tried to grab the handle and flames shot out.
163	12-03	1998 Ford Ranger	Driver started fueling process and returned to car to wait while the vehicle fueled. When driver returned and attempted to reach the nozzle she felt a charge from her palm and saw an explosion.
164	12-03	1996 Chevy Pickup	Driver exited vehicle to start fueling. Driver returned to truck to sit down. When fuel reached \$29, driver got out, touched the nozzle and saw fire.
165	1-04	1994 Honda Civic	Driver inserted nozzle to fuel car and returned to car to wait for fueling. After fueling completed, driver exited car and touched handle of pump. After flame occurred driver removed handle and ran to station to report fire.
167	2-04	Unknown	Driver exited vehicle, removed gas cap and put nozzle in fuel port to begin fueling. Driver got back into vehicle and sat down. Driver then exited vehicle and attempted to remove the nozzle. As soon as driver touched the nozzle, flames erupted.
169	5-04	1996 Isuzu Trooper	Driver placed nozzle into vehicle and returned to the car to sit with son. As fuel approached the \$30 mark, she slid out of the car and reached for the nozzle. Driver saw a spark leap from her hand to the nozzle, which ignited in flames.
171	2-24-06	Unknown	A lady was fueling her car. She opened the door to put her purse back inside her vehicle. When she returned, the pump caught fire.
175	12-8-06	Pickup	Driver started fueling and got back in vehicle. After fueling, driver exited truck and removed nozzle. When he reached for nozzle, sparks ignited.
176	11-12-06	Van	Driver got back in car, came back out of vehicle prior to flash fire/vapor flash.
178	2-5-05	SUV	Driver began to pump gas into the vehicle. Driver got back into vehicle. Once the pump stopped, she got out of the car and approached the fuel dispensing nozzle, which resulted in a fire in and around the car and damage to the pump.
179	1-25-07	1998 Ford Ranger	Started pumping, got back into truck. Got out of truck, on cell phone and fire ignited.
180	1-08	1999 Ford Ranger	Driver got out of vehicle to begin fueling. She engaged the hold-down clip to fill automatically and

returned to sit in the vehicle. When the tank was full she got out of the vehicle and reached for the nozzle. Felt a shock and fire came out of the tank.

181	1-18-08	Minivan	Driver got out of vehicle to begin fueling. He got back in his car, to warm up. When he returned and touched the nozzle, the vehicle and gas pump burst into flames.
182	12-15-09	Car	Driver left the car running and was talking on cell phone as he started the gas pump. Police said static electricity generated by the man getting in and out of his car likely sparked the fire.

52 Fires Reported to PEI Where Refueler Did Not Reenter the Vehicle and/or Touch the Nozzle During Refueling

Log#	Date	Yr./Make Vehicle	Description of Incident
7	11-99	Dodge Caravan	Customer got in car and saw flames shooting out of the filler neck.
8	11-99	Geo Prizm	It was chilly that morning and the driver got out of his truck and put on a nylon jacket. He held the nozzle and fire traveled up the driver's arm.
10	2-00	1998 Pontiac Sunbird	Customer began fueling, returned to inside of the car, got out of the car and flash occurred as she approached the right quarter panel. She never touched the nozzle. This is on video.
14	6-99	1984 Ford Bronco II	Fueler was standing between the pump and vehicle when he noticed flames at eye level. 8 1/2 gallons were dispensed.
17	1-00	1999 Ford F-150	Began fueling, got back into vehicle, saw dispenser was near amount she wanted to purchase, jumped out of vehicle to shut off the nozzle and said, "It is on fire."
20	10-97	1991 Chevy Lumina	Driver was sitting in her vehicle when the nozzle shut off and the fire occurred. She saw it in her rear view mirror.
24	7-98	1997 Dodge Ram Pick-up Truck	Placed nozzle, attached to aboveground storage tank, in fuel port of car and started fueling. Went into the shop to consult colleague. Noticed smoke and then a fire. No sign of spilled fuel.
31	12-99	Honda Accord	Popped the lid to her gas tank before getting out of the car, then walked over to fill port and flipped the lid open with her key. The gas cap was never opened. Flames engulfed her car.
33	12-99	1994 Dodge Pickup	Customer began to fuel at #4 dispenser and fire erupted. Customer pulled back, put nozzle away, and went into store. Clerk hit E-Stop. Fire went out.
34	4-99	1999 Dodge Dakota	Started fueling and set the hold-open latch. Returned to cab to check purse for money. Remained outside the vehicle. Returned to fill port and shut off nozzle. Noticed flames as soon as the nozzle was released.

37	5-98	1989 Ford 70 passenger school bus	Bus pulled up beside dispenser, driver turned dispenser on and as soon as nozzle was opened, flash occurred.
71	1-00	1999 Ford Expedition SUV	Inserted nozzle. Started pump. One hand on vehicle and one on nozzle. Looked at dispenser. Arm holding nozzle got warm. 3 to 5 foot flame.
74	1-00	1988 Chevy Silverado	Turned truck off. Nozzle in truck. Got inside vehicle and put on accessory to listen to radio. Dispensed \$6 and saw fire coming from side of truck.
77	2-00	1987 Honda Civic	The customer removed the gas cap and the fumes ignited.
79	5-96	1992 Honda Accord	My son went from the rider's side of the car, opened the fuel door, and unscrewed the cap. Took the nozzle from the dispenser and put it in car. Before dispensing began, flames shot out like a dragon shooting out fire.
80	2-00	1999 or 2000 Honda CRV	A woman was in the process of refueling her Honda CRV. She put \$10 in when a flashback occurred.
83	Winter 1999	1994 Dodge Caravan	I put the nozzle in tank, clicked it to pump itself, and sat back down in van. I stepped out of my van and turned toward the nozzle and there was fire coming out of the end of the nozzle and flames were shooting over the top of the van. I never touched the nozzle the second time before the fire.
85	2-00	Unknown	Motorist got out of car and touched gas cap. Explosion and fire.
86	3-00	SUV	Fueling with hold-open clip on. During the process, she was petting her small dog which had just returned from groomers. Put dog down, touched nozzle and fire started.
92	4-95	1987 Mazda Pickup	While fueling, heard popping sound and fire started coming out of nozzle.
94	8-00	2000 Toyota Sienna Van	Started fueling vehicle. Driver cleaned windows then reached for nozzle to take off automatic. Fire started.
95	2-01	2000 Nissan Maxima	Driver noticed static shock when getting out of car. When he removed gas cap, flames shot out.
96	2-01	1997 Mazda Protégé	16 year old girl began to fuel car. Got back in and sat down. Got out and shut door. Stood against car watching the dispenser. Grabbed the nozzle. It was too hot to hold. Dropped nozzle and gasoline spilled. Caught fire and burned the car.
97	2-01	1992 Chevy Lumina	Driver set auto-fill on nozzle. Started to get back in vehicle and flames appeared.
98	2-01	1999 Ford Windstar	Customer was pumping fuel, heard spark and flames appeared.
101	1-02	1991 Suzuki Sidekick	Upon removal of gas cap, fire shot out.
102	2-02	1996 Toyota Corolla	Driver opened fuel door, turned gas cap and a flash fire occurred.
108	6-02	1996 Ford Contour	Removed gas cap prior to going in to pay. Driver leaned against car while fueling. Fire started after 10 gallons were pumped.
109	2-01	1994 Toyota Maxima	Vapors ignited while pumping fuel.
111	3-99	1994 Chevy Camaro	Flash from fuel port. When nozzle was pulled out fuel went everywhere and caught fire.
119	3-02	2000 Honda Odyssey	Driver turned off the motor. While removing the gas cap, a flame of fire burst out of tank.
123	5-02	1992 Subaru Legacy	Driver reached for gas cap when static spark jumped from finger to area around gas cap. Small flame ignited around gas cap.

124	8-02	1993 Dodge Caravan	Driver got out of van and turned gas cap ¼ to ½ turn. Flames shot out around gas cap.
125	4-02	Ford Aerostar	Driver filled up car. While driving away, noticed gas cap still lying on seat of car. Stopped car, got out to put cap back on. Gas tank erupted in fire.
126	11-97	1994 Nissan Altima	Driver pulled up to pump, pulled the lever inside the vehicle that opens the lid and got out of the vehicle. Driver quickly untwisted the plastic gas cap, heard air rush out, and placed the plastic cap in the inside lid holder. Fire ignited from the car.
128	5-98	1990 passenger car	Driver exited vehicle and unscrewed gas cap. Fire 4 inches high started around gas port.
129	2-02	Mid-size sedan	Driver got out of car. Vapors ignited when gas cap was removed.
130	2000	1993 Subaru Legacy	As driver unscrewed the gas cap fire flashed flames about a foot.
132	9-02	2001 Honda Civic EX	Driver turned the gas cap to begin fueling and saw a flame.
137	11-96	1996 Pontiac Firebird	Passenger got out of vehicle and removed gas cap to begin fueling. He was standing between pump and vehicle with right hand near nozzle when flames shot up from fuel port.
140	9-02	Subaru	Fire occurred when customer removed fuel cap.
142	12-00	Nissan Altima	Driver pumping gasoline and heard a sound like a strong wind. Flames were coming from gas tank.
143	12-02	2001 Ford F-250	After placing nozzle in the fuel fill port and locking it in the open position, driver opened driver's door to get in due to cold weather. While exiting the vehicle he noticed a small fire around fuel intake port and nozzle.
150	1-03	1990 Honda Accord	Driver proceeded to twist off gas cap. Fire came shooting out and stayed lit until put out with a fire extinguisher.
153	6-03	2000 Honda Civic	Driver was unscrewing gas cap 1/4 turn. Small blue flame came out from around the cap.
155	2-03	1997 Ford F-150 Truck	Driver exited the vehicle and observed fire at the gas filler to the gas tank. Driver did not touch the nozzle. Continuity was verified on the dispensing equipment.
157	2-02	1994 Chevy Lumina	Fueled car. Fire occurred as pump handle was removed from car. Flames shot out.
161	12-03	Unknown	Driver exited car and opened door to fill pipe. As she removed gas cap a fire four to five feet erupted.
170	1-05	Honda CRV	Driver felt a small shock when removing the gas cap. Flames started coming out of the refueling hole. Flames shot out about 8 inches.
172	3-05	Cat Excavator	Lifted nozzle to check for flow. The tank was near empty. Vapors rising from the tank. Flash fire occurred.
173	1-06	93 Mazda Protege	Driver backed up to the pump. Turned off ignition. Popped gas tank lever and got out of the car. Turned the gas tank lid 1/4 turn. Fire blazed out of tank.
174	9-00	Unknown	Came out of station. Fire started out the side of my car. When I pulled the nozzle out, it sprayed gas all over the car.

**Fires Reported by Respondents to the
National Highway Traffic Safety Administration Vehicle
Owner's Questionnaire (VOQ)**

Thirty-Four (34) Vehicle Owner's Questionnaires (VOQs) from the National Highway Traffic Safety Administration's database contained enough pertinent information to be included in this compilation. Seventeen (17) VOQs described fires that occurred before, during or immediately after the gas cap was removed and before fueling began. Although technically not a refueling fire, they are included because they describe fires that occurred during the first step of the refueling process. Descriptions of events leading up to the 17 fires are included under the sheet entitled NHTSA'S GAS CAP FIRES.

The other 17 fires described in the VOQs are all refueling fires and appear to have fact patterns similar to those received by PEI. We have not been able to verify that the cause(s) of these 17 fires were not due to smoking, an engine on, or lack of electrical continuity between the nozzle and dispenser. This is because incomplete information was contained in the VOQs and we were unable to contact the victims to "fill in the blanks," since the VOQs do not identify those who submitted the reports. Descriptions of the fire events can be found under the sheet entitled NHTSA'S 17 OTHER REFUELING FIRES. The reader of this report can decide the relative value of this information to the overall study.

NHTSA'S GAS CAP FIRES

Log #	Date	Yr./Make Vehicle	Description of Incident
46	5-23-97	1997 Dodge Caravan	I was going to put gas in and as I was taking the gas cap off flames were coming out from under the gas cap. They were orange and blue.
49	11-25-98	1991 Toyota Camry	About to put gas in vehicle, gas tank seemed to result in combustion, and flames came out of tank. No fuel leak.
50	3-1-94	1993 Subaru Legacy	Owner took gas cap off, heard a hissing sound and a few seconds later there were flames shooting out of the vehicle.
52	2-2-95	1994 Mazda Protégé	Turned the gas cap and flames shot out from tank.
53	3-30-95	1993 Mazda Protégé	After turning the gas cap, the gas tank opening ignited. The cap had only been turned slightly before it ignited.
54	12-16-96	1993 Mazda Protégé	Flames were coming out of the fuel tank when the cap was removed.
56	4-3-97	1997 Honda Civic	When taking the gas cap off of the fuel tank, flames were coming out of the tank around the filler neck.
57	2-3-94	1991 Toyota Corolla	Owner took gas cap off to get gas and flames shot out of truck. Fire department said it was a short in the fuel pump.
58	9-26-93	1993 Toyota Corolla	1/8 full. Fire inside the tank when the cap was removed.
59	11-15-98	1996 Toyota Corolla	I turned the gas cap to remove it before filling the car, flames shot out of the gas tank (full description provided).
61	3-2-95	1993 Toyota Previa Truck	Removed gas cap to fill, flames burst out of gas tank.
62	4-12-97	1992 Toyota Previa	When opening fuel filler tank cap, a flame shot out.
63	5-18-94	1991 Toyota Truck Land Cruiser	While unscrewing the gas cap to pump gas, the gas tank burst into flames at a gas station.
66	2-27-99	1999 Jeep Wrangler	I took the gas cap off to fill up, noticed a fire in the gas tank and in an instant, flames shot out (full

			description provided).
67	Unknown	1995 Isuzu Trooper Truck	Upon removing pressure vacuum relief filler cap, flames spewed out of the filler neck.
68	Unknown	1991 Toyota Truck-Previa	Upon unscrewing pressure vacuum filler cap, flames spewed from filler neck for 5-7 seconds.
69	2-24-99	1992 Toyota Camry	When removing the gas cap at the gas station, a flame shot out of the tank after one turn of the cap.

17 Fires While Removing Gasoline Cap – NHTSA

Make and Model of Vehicles Involved

2	Toyota Camry (1991, 1992)
3	Toyota corolla (1991, 1993, 1996)
3	Toyota Previa (1991, 1992, 1992)
1	Toyota Land Cruiser (1991)
3	Mazda Protégé (2-1993, 1994)
1	Dodge Caravan (1997)
1	Subaru Legacy (1993)
1	Honda Civic (1997)
1	Jeep Wrangler (1999)
1	Isuzu Truck Trooper (1995)

NHTSA'S 17 OTHER REFUELING FIRES

Log #	Date	Yr./Make Vehicle	Description of Incident
42	4-15-95	1994 F150 Ford Truck	While fueling gas tank, flames/fire suddenly appear from gas tank hole. Static discharge caused gas flames to ignite from gas tank, resulting in a fire.
44	3-1-97	1996 Chevy Suburban	Consumer was filling the vehicle with fuel and there was some type of electrical static and the vehicle caught fire around the filler neck.
5	11-99	1999 Ford Windstar	Started fueling. Went back into car to get money. During that time the automatic nozzle clicked off. Went to pump more and it sparked between the nozzle and her hand.
38	11-30-99	1992 Dodge Caravan	While filling the fuel tank, a fire erupted due to the fumes coming from the tank, possibly from static electricity. The Dodge distributor suggested I let them install a ground strap on the fuel filler neck of the fuel tank.
39	2-23-99	1991 Geo Prizm	As I stopped at a gas station and attempted to fill up with gas, my jacket sleeve caught on fire from flames coming out from the tank.
40	4-20-95	1994 Geo Prizm	Flames around opening of gas tank.
43	8-9-96	1996 Ford Taurus	Pulled into gas station, filled tank, as hand touched pump nozzle fuel tank burst into flames.
45	11-21-98	1997 Chevy Cavalier	While filling gas tank the check engine light is on,

47	12-9-95	1996 Dodge Caravan Truck	vehicle caught fire in fuel tank, which caused injuries. Fire ignited inside or outside of tank while filling tank; flames started shooting out of gas tank, gas nozzle caught fire, thrown to ground, ground caught fire.
48	2-3-96	1996 Dodge Caravan	I started to fill up at the pump. I saw a flash as I put the tip of the gas hose into the opening of the tank. Not a second later, flames came from out of the tank. I immediately removed the hose from the tank, even though the tip of the hose still had flames in it. Pulling the hose out as fast as I could, gas spilled on the ground near the van and other pumps, and caught the ground on fire.
51	3-12-97	1995 Pontiac Transport	After filling the vehicle with fuel and removing the nozzle, the vehicle caught on fire around the filler neck.
55	11-16-99	1999 Honda Odyssey	While filling the van with fuel, it caught fire and burned.
60	8-3-99	1996 Toyota Corolla	Fire occurred at gas nozzle, which was 3-5 seconds into the fueling process.
64	11-12-96	1994 Dodge Caravan	When refueling vehicle at the fuel filler pipe neck, a spark occurred, causing a fire.
65	9-30-95	1995 Dodge Neon	Fuel tank filler pipe caught fire when filling up the tank.
70	Unknown	1996 Audi S6	While refueling with the engine off, a flame shot out of the gas tank.
85	3-8-00	2000 Ford F150 Truck	Vehicle experienced a fire while consumer's son was filling the fuel tank at a gas station. Local fire department arrived and extinguished the fire. Fire Department informed consumer that static electricity may have been cause of fire.