Louisiana Natural Gas Release Incidents Review 2010-2012

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1.0 Introduction

Natural gas is a combustible, gaseous mixture of simple hydrocarbon compounds, mostly methane, usually found in deep underground reservoirs formed by porous rock. Natural gas is widely used as a fuel in residential, commercial and industrial applications. Three segments of the natural gas industry are involved in delivering natural gas from the wellhead to the consumer: production of the gas through exploration, drilling and extraction of natural gas from wells; transmission through pipelines to distribution centers; and distribution by local utilities that deliver natural gas to the customer.

Transporting natural gas from the wellhead to the final customer involves several physical transfers and multiple processing steps. A natural gas pipeline system begins at the natural gas producing well or field. Once the gas leaves the producing well, a pipeline gathering system directs the flow either to a natural gas processing plant or directly to the mainline transmission grid, depending upon the initial quality of the wellhead product[1] (Fig 1).

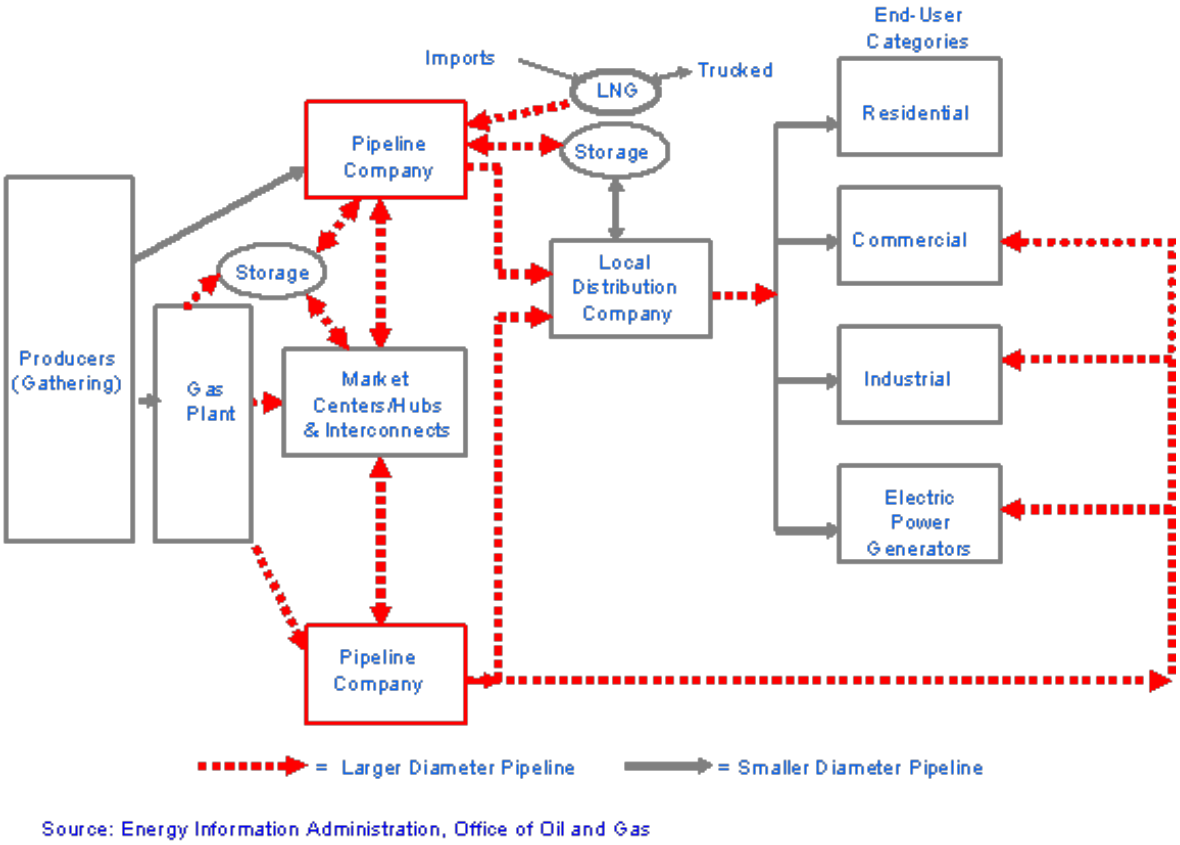

Figure 1: Natural Gas Transmission Path[1]

The majority (about 82%) of natural gas is produced domestically[2], with Louisiana being America's second largest producer[3]. Large volumes of natural gas are produced, stored, transported, and distributed throughout the state. Accidental releases may occur during the movement and use of the natural gas.

Natural gas release accidents happen almost every day around the nation, and some of the incidents may cause property damages, injuries, or even fatalities.[4] The Louisiana Department of Health and Hospitals / Office of Public Health / Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET) receives email alerts regarding emergency release events from Louisiana State Police (LSP) and National Response Center (NRC), including natural gas release incidents. In this review, we summarize the accidental natural gas release incident reports received from Louisiana State Police during period of 2010-2012, to identify the potential trends and risk factors in natural gas release-related emergency incidents in Louisiana.

2.0 Methods and Results

Several data sets for the natural gas events from 2010 to 2012 were provided through the courtesy of the LSP as Microsoft Excel spreadsheets. These spreadsheets were imported and appended into one Microsoft Access database. The frequency of natural gas events was tabulated. In total, 9,576 natural gas related incidents were reported to the LSP between 2010 and 2012 in Louisiana. Of those, 7,772 incidents were accidental releases, which will be the focus of this review.

The data received from LSP did not indicate the "Cause of the Incident". This information was obtained from dataset field "Initial Report Detail" and "Update to The Report Detail" to identify possible causes for an accident.

2.1 Accidental Release: Monthly and yearly Trend

According to the data received from LSP, there were 2,597 reported accidental release of natural gas in Louisiana in 2010, which increased 13.2% to 2,938 in 2011, and decreased 23.9% to 2,237 in 2012 (Fig 2).

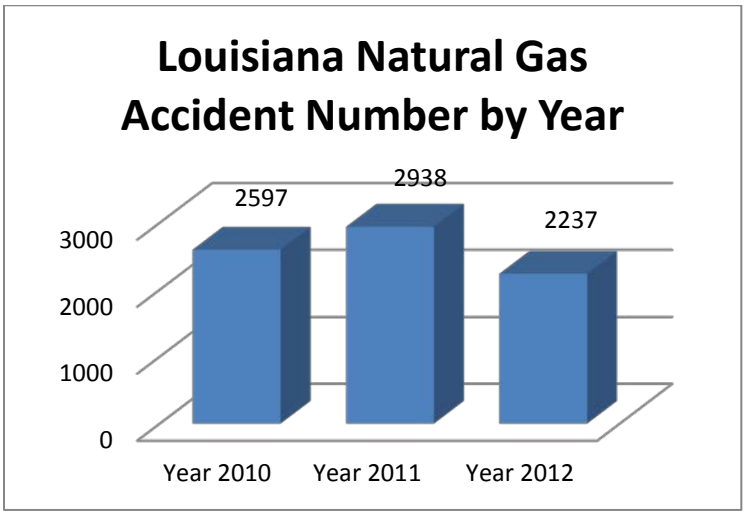

Figure 2: Louisiana Natural Gas Total Accident Number by Year

While the annual reports of natural gas release fluctuate, there are trends for monthly releases from 2010 to 2012 (Fig. 3). The three year trends show that the colder months (January, February, November, and December) have the lowest number of accidents and the warmer months (May, June, July, and August) have the highest number of accidents. After February, the number of incidents steadily rises

until May, and remains elevated from May to August; the trends starts to decline in September until reaching to the lowest levels in November and December.

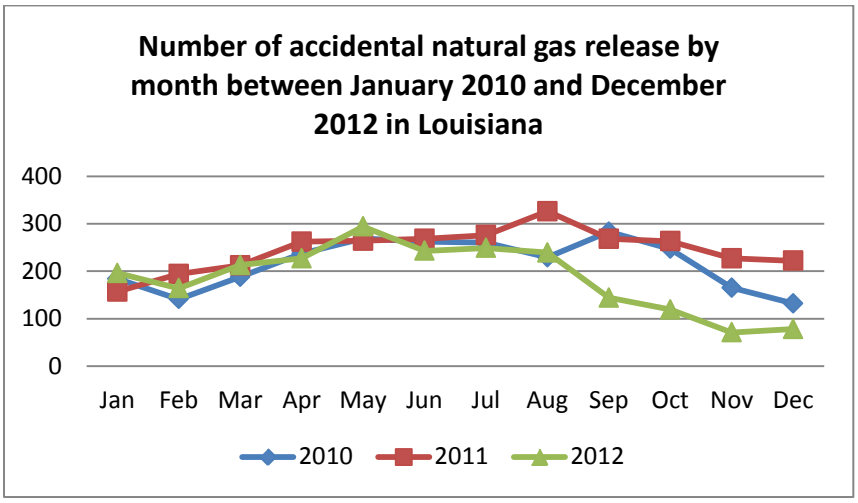

Figure 3: Number of accidental natural gas release by month between January 2010 and December 2012 in Louisiana

The seasonal trend for the natural gas accident release can be viewed more clearly using the three year average monthly data (Fig.4).

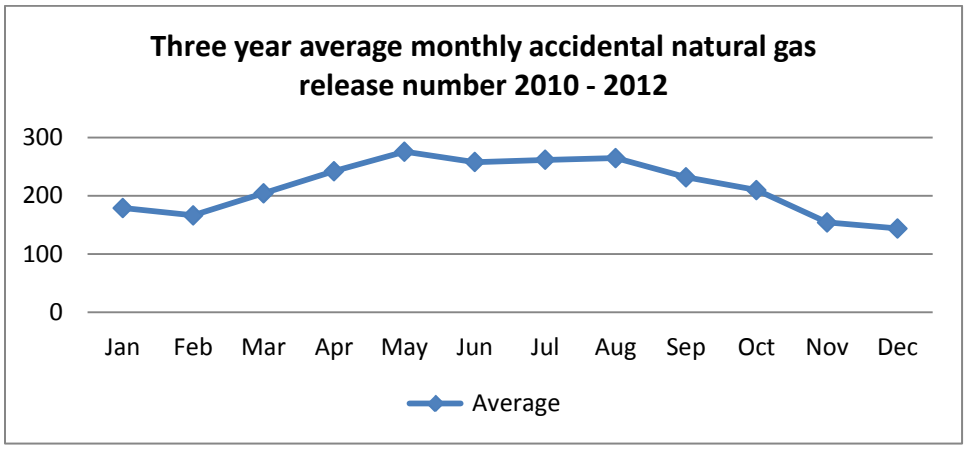

Figure 4: Three year average accidental natural gas release number by month

2.2 Accidental Release: Parishes and Cities

From January 2010 to December 2012, Caddo Parish reported the largest number of reported natural gas accidents (total 1,169, 15.0%) in Louisiana. Other parishes reporting high numbers of natural gas accidents were East Baton Rouge (689, 8.9%), Calcasieu (470, 6.0%), Bossier (455, 5.9%), and Lafayette (410, 5.3%). The total number of accidents from these 5 parishes accounted for more than 40% of the state's total number (3,199, 41.2%).

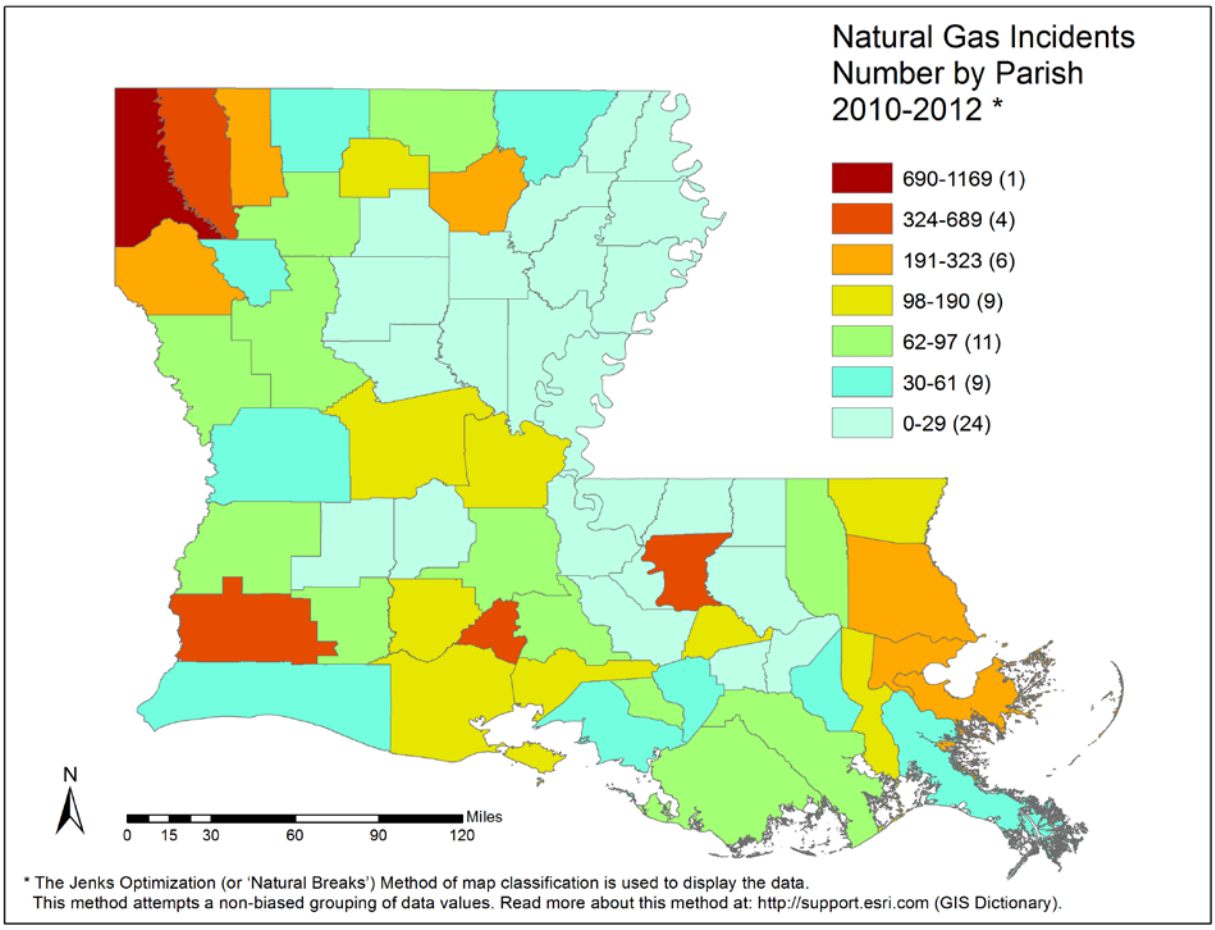

Figure 5: Distributions natural Gas Accidents by Parishes in Louisiana 2010-2012

There are 28 parishes that had less than 50 accidents for period from 2010 to 2012. Among them, West Feliciana Parish and Catahoula Parish are the only two parishes that have not seen any reported accidental natural gas release in the years reviewed.

The cities with the highest reports of accidental release are Shreveport (Caddo Parish) and Baton Rouge (East Baton Rouge Parish) which are in the parishes that report the highest accidental releases.

2.3 Accidental Release: Types and Causes

The majority of the accidental releases occur with gas lines (smaller diameter pipeline, diameter less than 1 inch, 4725, 60.8%), followed by meters (1231, 15.8%), risers (543, 7.0%), main lines (larger diameter pipeline, diameter larger than 1 inch, 537, 6.9%), gas production (165, 2%), and other types. Combining gas line and main line accidents together, pipeline accidents accounted for more than two thirds of all the reported accidents (5262, 67.7%). Most of these release types follow the same pattern: the accidents increased in 2010 to 2011, and then decreased in 2011 to 2012. However, accidental releases involving gas production increased steadily from 2010 to 2012, especially in 2012.

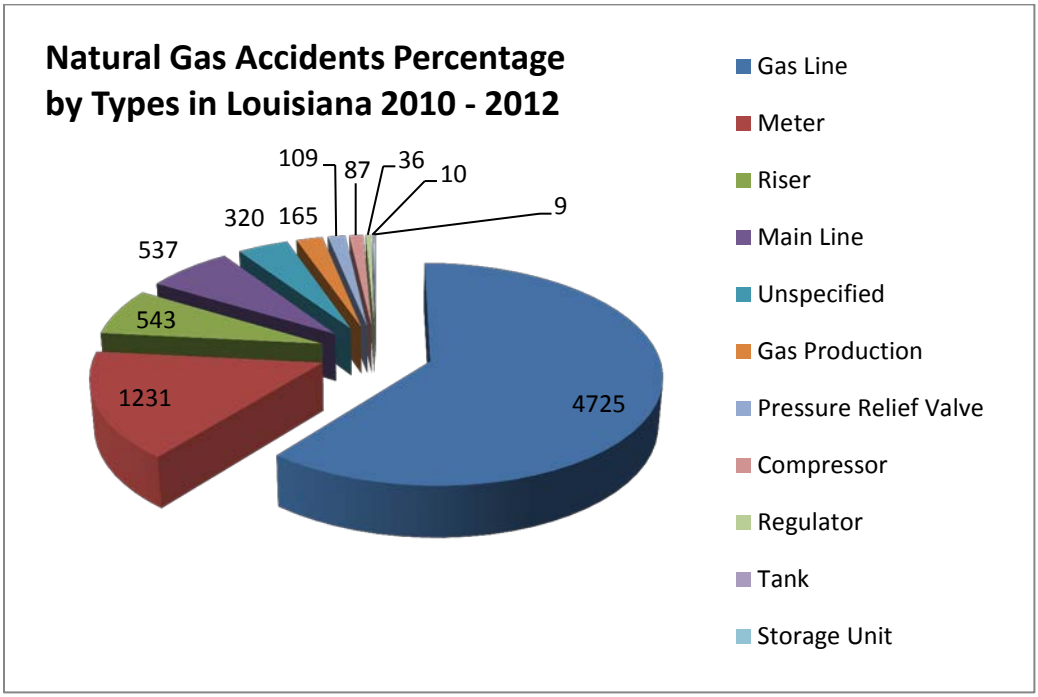

Figure 6: Natural Gas Accidents Percentage by Sites in Louisiana from 2010 to 2012

The majority (4,781, 61.5%) of the reported natural gas release accidents in Louisiana from 2010 to 2012 were caused by excavation. The number of natural gas release accidents caused by “striking” (vehicle running over) ranked second. Equipment failure is the third major cause of the natural gas release incidents (Fig 7).

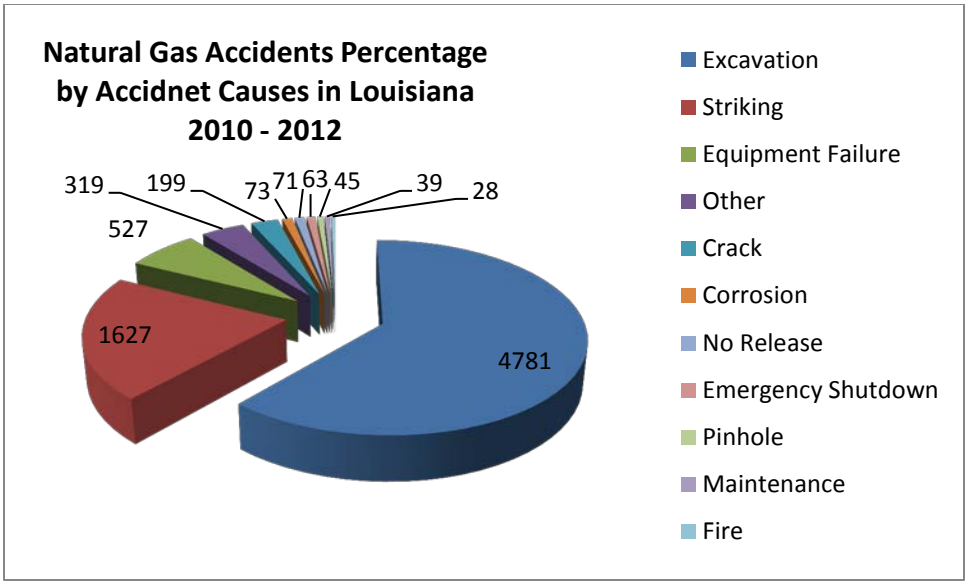

Figure 7: Natural Gas Accidents Percentage by Accidents in Louisiana from 2010 to 2012

As shown in Fig 8, excavation is the leading cause of the pipeline natural gas accidental release accidents, accounting for 89.7% of all gas line accidents and 92.2% of all main line accidents. “Striking” (mostly with vehicles) is the leading causes of meter and riser accidents, accounting for 88.1% of all meter accidents and 88.2% of all riser accidents.

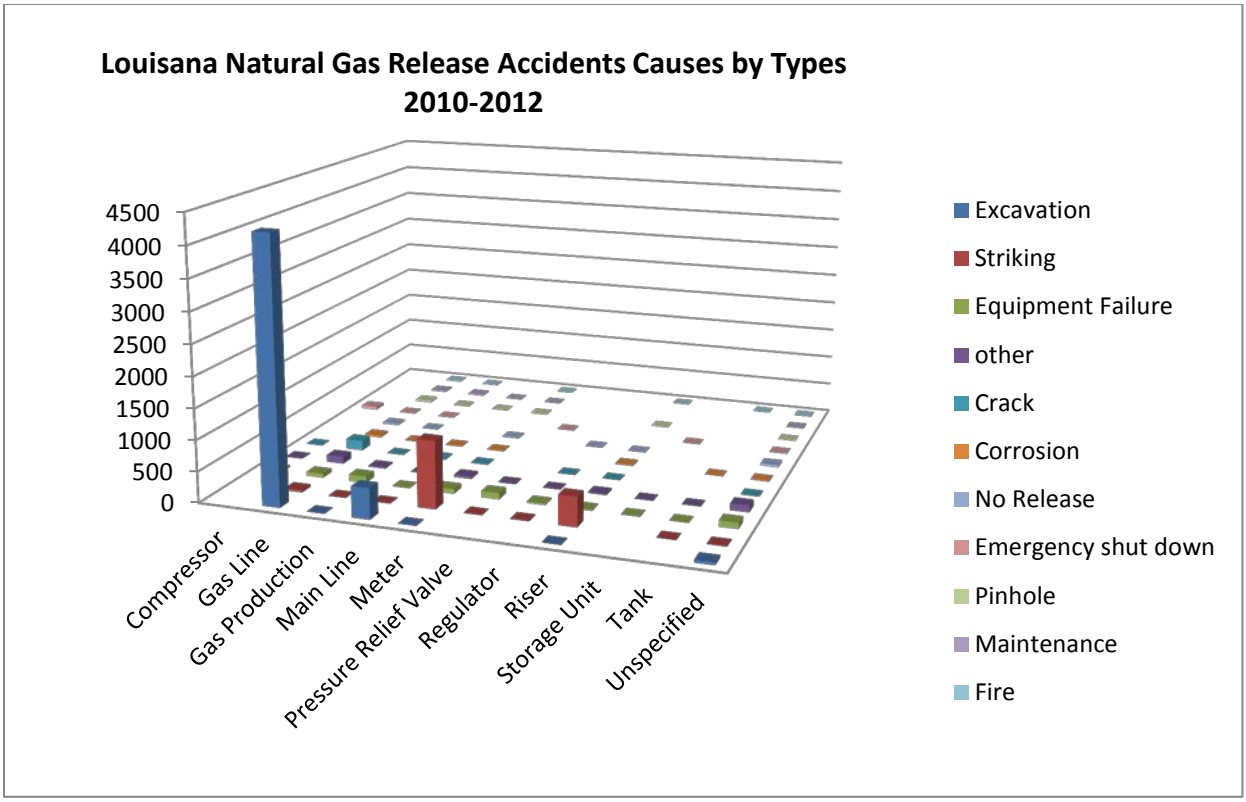

Figure 8: Louisiana Natural Gas Release Accidents Causes by Types

2.4 Public Safety Impact from Natural Gas Release Accidents

2.4.1 Injury and Fatality

From 2010 to 2012, there were 15 reported natural gas release accidents that involved injuries. Among these accidents, 8 were the type of "striking" with a vehicle, where the injuries were associated with the car accidents rather than from the natural gas releases. Two incidents were caused by excavation, 2 by equipment failure, 1 by corrosion, 1 by fire, and 1 by other unidentified cause. No natural gas release accident in Louisiana resulted in a fatality.

2.4.2 Fire

From 2010 to 2012, there were 61 reported natural gas release accidents that involved fire. Among these accidents, 23 were caused by fire, eleven by excavation, 7 by "striking" by a vehicle, 6 by equipment failure, 1 by corrosion, 1 by crack, 1 by emergency shutdown, and 10 by other unidentified causes.

2.4.3 Evacuation

From 2010 to 2012, there were 68 reported natural gas release accidents which resulted in evacuation as a precautionary measure. Among these accidents, 38 were caused by excavation, 11 by striking (vehicles or falling tree), 9 by equipment failure, 4 by crack, 1 by corrosion, 1 by fire, and 4 by other causes.

3.0 Discussion and Recommendation

There were 7772 accidental release incidents of natural gas reported in Louisiana from 2010 to 2012, averaging 7 incidents per day. Seasonal trends show fewer accidents incidents in the colder months of January, February, November, and December and increased accidents in the warmer the months of May, June, July, and August. While factors relating to the seasonal trend for the accidental natural gas releases are not known, they may correspond to increases in construction in warmer weather since excavation is designated as a primary cause of the events.

The majority (4,781, 61.5%) of the reported natural gas release accidents in Louisiana from 2010 to 2012 were caused by excavation, i.e. digging near existing gas line. According to the "Louisiana Underground Utilities and Facilities Damage Prevention Law" originally passed in 1988 and amended in 1997 and 2011, excavators and demolition crews are required to dial 811 for Louisiana One Call and wait two business days for the gas company to mark the location of its lines. Frequently excavation damage results from either someone excavating without calling in and waiting the standard 48-hours, or from the gas company wrongly marking the location of its lines.

There were 61 reported incidents that include fire, and 15 incidents resulting in injuries; no incident with a fatality was reported in Louisiana from 2010 to 2012. Natural gas explosion occurs when the natural gas concentration reaches a certain level and there is an ignition source. Preventing natural gas leakage and shortening the duration of the leak when a leak does occur are practical and critical in the prevention of a natural gas explosion.

For future studies, more specific information regarding the natural gas pipelines (whether they belong to production companies, transmission pipeline companies, or local distribution companies) need to be collected to better understand the potential trends and risk factors in natural gas release-related emergency incidents occurring in Louisiana.

Reference:

1. http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/process.html
2. http://www.aga.org/Kc/aboutnaturalgas/consumerinfo/Pages/whatisng.aspx
3. http://www.eia.gov/todayinenergy/detail.cfm?id=6030
4. http://primis.phmsa.dot.gov/comm/reports/safety/sigpsi.html

Appendix

Table 1: Reported Natural Gas Accidents by Parishes in Louisiana in 2010-2012

Parish	2010	2011	2012	Total	Percentage
Caddo	380	467	322	1169	15.0%
East Baton Rouge	261	260	168	689	8.9%
Calcasieu	170	182	118	470	6.0%
Bossier	148	203	104	455	5.9%
Lafayette	123	161	126	410	5.3%
Ouachita	94	148	81	323	4.2%
St Tammany	100	102	88	290	3.7%
Orleans	83	85	82	250	3.2%
Webster	100	87	62	249	3.2%
De Soto	51	68	122	241	3.1%
St Bernard	59	110	44	213	2.7%
Ascension	55	78	57	190	2.4%
Jefferson	60	51	75	186	2.4%
Avoyelles	47	75	44	166	2.1%
Lincoln	52	61	53	166	2.1%
Iberia	48	65	45	158	2.0%
Acadia	49	56	41	146	1.9%
Rapides	46	42	44	132	1.7%
Vermilion	51	37	34	122	1.6%
Washington	51	38	31	120	1.5%
St Landry	35	40	22	97	1.2%
Terrebonne	41	33	22	96	1.2%
St Martin	28	40	22	90	1.2%
Sabine	13	27	48	88	1.1%
Jefferson Davis	37	23	25	85	1.1%
Tangipahoa	23	26	34	83	1.1%
Union	35	23	18	76	1.0%
Beauregard	25	26	21	72	0.9%
Lafourche	30	17	23	70	0.9%
Bienville	21	21	27	69	0.9%
Natchitoches	24	26	17	67	0.9%
Claiborne	24	20	17	61	0.8%
Morehouse	11	22	22	55	0.7%
St Mary	18	21	16	55	0.7%
Cameron	26	18	8	52	0.7%
Vernon	15	20	16	51	0.7%
Plaquemines	9	17	18	44	0.6%
Red River	16	9	18	43	0.6%
St Charles	13	12	11	36	0.5%
Assumption	18	9	7	34	0.4%

Allen	12	7	10	29	0.4%
Livingston	4	10	13	27	0.3%
Richland	12	10	5	27	0.3%
St John	7	12	4	23	0.3%
Grant	6	11	4	21	0.3%
Concordia	3	4	11	18	0.2%
Jackson	6	4	8	18	0.2%
Evangeline	9	5	3	17	0.2%
East Carroll	7	7	2	16	0.2%
Caldwell	3	9	3	15	0.2%
Winn	9	1	5	15	0.2%
Madison	7	4	1	12	0.2%
Franklin	6	3	2	11	0.1%
Iberville	5	3	2	10	0.1%
West Carroll	2	7	0	9	0.1%
La Salle	3	3	2	8	0.1%
St James	1	3	3	7	0.1%
St Helena	2	3	1	6	0.1%
East Feliciana	0	2	3	5	0.1%
Pointe Coupee	2	2	1	5	0.1%
West Baton Rouge	0	2	1	3	0.0%
Tensas	1	0	0	1	0.0%
Catahoula	0	0	0	0	0.0%
West Feliciana	0	0	0	0	0.0%
Total	2597	2938	2237	7772	100.0%

Table 2: Top 5 Cities in Louisiana with Most Reported Natural Gas Accidents 2010-2012

City	**2010**	**2011**	**2012**	**Total**
Shreveport	296	367	266	929
Baton Rouge	249	257	162	668
Lake Charles	123	133	74	330
Lafayette	87	119	88	294
New Orleans	83	85	83	251

Table 3: Natural Gas Accidents Numbers by Sites in Louisiana from 2010 to 2012

Incidents Site	Total	Percentage	2010	2011	2012
Gas Line	4725	60.8%	1592	1775	1358
Meter	1231	15.8%	422	482	327
Riser	543	7.0%	199	221	123
Main Line	537	6.9%	166	199	172
Unspecified	320	4.1%	107	144	69
Gas Production	165	2.1%	29	36	100
Pressure Relief Valve	109	1.4%	33	30	46
Compressor	87	1.1%	29	30	28
Regulator	36	0.5%	15	14	7
Tank	10	0.1%	3	4	3
Storage Unit	9	0.1%	2	3	4

Table 4: Natural Gas Accidents Numbers by Causes in Louisiana from 2010 to 2012

Causes	Total	Percentage	2010	2011	2012
Excavation	4781	61.5%	1584	1827	1370
Striking	1627	20.9%	578	636	413
Equipment Failure	527	6.8%	131	179	217
Other	319	4.1%	160	97	62
Crack	199	2.6%	59	69	71
Corrosion	73	0.9%	21	33	19
No Release	71	0.9%	15	32	24
Emergency Shutdown	63	0.8%	23	22	18
Pinhole	45	0.6%	16	15	14
Maintenance	39	0.5%	3	19	17
Fire	28	0.4%	7	9	12

Table 5: Natural Gas Accidents Numbers by Types and Causes in Louisiana from 2010 to 2012

Causes	Compressor	Gas Line	Gas Production	Main Line	Meter	Pressure Relief Valve	Regulator	Riser	Storage Unit	Tank	Unspecified
Excavation		4238	1	495	1			1			45
Striking		38	3	1	1084	3	9	479		1	9
Equipment Failure	34	63	105	4	76	101	21	17	6	2	98
Other	6	114	20	6	37	2	2	20	2	3	107
Crack	1	162	4	21	7		1	1			2
Corrosion		30	3	7	6			16		1	10
No Release		22	1		11		3	2			32
Emergency shut down	46	5	4			3			1		4
Pinhole		28	4	2	4			5			2
Maintenance		15	16	1	2						5
Fire		10	4		3			2		3	6
Total	**87**	**4725**	**165**	**537**	**1231**	**109**	**36**	**543**	**9**	**10**	**320**

Table 6: Natural Gas Accidents Injury Cases by Causes and Types in Louisiana from 2010 to 2012

Causes	Gas Line	Gas Production	Meter	Riser	Total
Corrosion				1	1
Equipment Failure	1	1			2
Excavation	2				2
Fire			1		1
Other		1			1
Striking	1		5	2	8
Total	**4**	**2**	**6**	**3**	**15**

Table 7: Natural Gas Accidents Fire Cases by Causes and Types in Louisiana from 2010 to 2012

Fixed Site	Corrosion	Crack	Emergency shut down	Equipment Failure	Excavation	Fire	Other	Striking	Total
Compressor				1			1		2
Gas Line				1	10	8	2		21
Gas Production		1		3		4	1		9
Main Line					1				1
Meter				1		2	1	6	10
Riser	1					1	1	1	4
Storage Unit							1		1
Tank						3	1		4
Unspecified			1			5	2		8
Total	1	1	1	6	11	23	10	7	60

Table 8: Natural Gas Accidents Evacuation Cases by Causes and Types in Louisiana from 2010 to 2012

Fixed Site	Corrosion	Crack	Equipment Failure	Excavation	Fire	Other	Striking	Total
Gas Line	1	1	2	32		2	1	39
Gas Production		2	1		1	1		5
Main Line		1		6				7
Meter							6	6
Pressure Relief Valve			1					1
Riser			1				4	5
Tank			1					1
Unspecified			3			1		4
Total	1	4	9	38	1	4	11	68