



by Rita Tubb ■ Managing Editor

Gas Distribution Spending To Top \$8.9 Billion In 2006

The nation's gas distribution system has seen a number of changes over the past year. The wholesale price of natural gas rose from around \$6 per Mcf in May 2005 to near \$13 in early November, in large part because of the damage caused by Hurricanes Katrina and Rita which also shut down 10 percent of the nation's natural gas production and negatively impacted the plastic pipe market.

The U.S. Energy Information Administration has warned that customers who heat with natural gas can expect to pay 31-62 percent more this winter, depending on weather and other factors.

Such forecasts have many concerned. In hearings held Nov. 2 by the U.S. House Energy and Commerce Subcommittee on Air Quality, American Gas Association Vice

Chairman Stephen Ewing, who is also vice chairman of DTE Energy in Detroit, called for multiple actions to reduce natural gas prices for homes and businesses, including the construction of additional infrastructure, such as new pipelines to carry additional natural gas to where it is needed most, aggressive energy efficiency and increased natural gas production.

The nation's gas consumption also increased in 2004 to more than 22 Tcf, up from 21.5 Tcf consumed in 2003. According to the Energy Information Administration (EIA) overall, the U.S. depends on natural gas for about 24 percent of its total primary energy requirements, (oil accounts for about 40 percent and coal for 23 percent). Most of the growth in natural gas demand over the past year came from electric generators.

The growing demand for natural gas continues to put pressure on the gas distribution utilities, or local distribution companies (LDCs), that must deliver natural gas to more and more homes, businesses and industries through the U.S.

Pipe shortages

Utilities have seen an increase in PE pipe prices and a shortage of plastic pipe as ethylene feedstocks dropped following Hurricanes Katrina and Rita.

Dave Morgan, general manager of Performance Pipe, The Woodlands, TX said, "With the shutdown of many Gulf Coast petrochemical facilities in anticipation of the storms, and the physical damages sustained by several of those facilities, there has been, and is a shortage of resins available to the plastic pipe market. The resins shortage along with increased costs for raw materials, supplies and energy is causing product shortages and price increases throughout the supply chain.

"The current shortage is expected to be a short-term problem. We anticipate that the plastic pipe market will return to normal operations in early 2006."

NEW & REPLACEMENT MAINS & SERVICES, 2002-2006

		2006	2005	2004	2003	2002
Miles of Main	New	13,444	12,750	12,113	11,647	12,537
Miles of Main	Replacement	15,107	12,123	11,770	11,340	10,079
Total		28,551	24,873	23,883	22,987	22,616
Miles of Service	New	12,243	11,313	11,012	10,994	11,609
Miles of Service	Replacement	17,555	16,112	15,800	15,006	13,907
Totals		29,798	27,425	26,812	26,000	25,516
COMBINED TOTALS		58,429	52,303	50,645	48,987	48,132

U.S. GAS UTILITY EXPENDITURES, 2002-2006

Estimated Spending (\$1000)	2006	2005	2004	2003	2002
New Construction	3,996,800	3,572,800	3,512,340	3,408,790	3,507,243
3Fs	5,040,400	4,874,411	4,747,112	4,093,209	4,323,757
TOTALS	9,043,000	8,487,311	8,259,452	8,099,999	7,911,000



U.S. Department of Transportation Office of Pipeline Safety database that show “outside force” (earth movement, lightning, heavy rains and floods, temperature, high winds, operator excavation, third-party excavation damage, fire or explosion external to the pipeline, being struck by a vehicle not related to excavation and rupture of previously damaged pipe) accounted for 120 of the 172 incidents reported in 2004. Of the 120 reported, records show that 49, or 29 percent, were caused by excavation damage by a third party.

Spending trends

New construction spending and spending to rehabilitate, repair and replace existing infrastructure by LDCs is projected to rise. Supporting this are two recently released surveys. One, a long-term survey by the National Petroleum Council, estimates spending for new pipelines at \$5 billion per year for each of the next 20 years to expand the nation’s current 1.4 to 1.8 million mile distribution system by about 25 percent.

Corrosion, which is an ongoing problem in all facets of the oil and gas industry, will

continue to be costly for utilities because of the nation’s aging infrastructure. In an unrelated study on corrosion costs conducted by CCTechnologies in cooperation with NACE International and funded by the Federal Highway Administration, placed direct corrosion costs in gas distribution at \$5 billion per year.

Since both the new construction and corrosion cost figures were estimated prior to Hurricane Katrina and Rita, near-term spending in these two categories to replace and repair gas distribution facilities along the U.S. Gulf Coast will likely drive spending much higher.

As mentioned earlier, Entergy New Orleans, a company with 145,000 gas customers in the New Orleans area, was particularly hard hit by Katrina. According to company officials, some 1,200 miles of its gas mains were heavily damaged.

The hurricane-force winds of Katrina and Rita and the flooding that followed impacted other LDCs as well. Many reported significant pipeline system damage including exposed pipes, failure of pipelines crossing rivers and streams, damage to meter sets, pipeline leaks from soil movement and water leaking into pipeline system.

This, along with the damage and destruction of an estimated 302,000 homes by Katrina alone in Louisiana, Mississippi and Alabama does not bode well for near-term curtailed spending by LDCs along the Gulf Coast.

Katrina also caused widespread flooding in New Orleans, Mobile and elsewhere that left gas mains and services inundated with salt water, causing near-term spending to rehabilitate, repair and replace existing mains and services to rise.

For these reasons, *Underground Construction’s* Annual Pipeline Survey indicates gas utilities spending next year to serve new customers and upgrade existing systems will total an estimated \$3.9 billion, compared to \$3.5 billion this year, while spending to rehabilitate repair and replace the nation’s 1.8 million miles of mains and services, meters, valves, regulators, cathodic protection, SCADA networks and peak shaving facilities will total an estimated \$5 billion.

Survey results

Gas utilities were surveyed throughout the U.S. to inquire about the status of pipe and main repair and replacement programs, the cost of finding and repairing leaky mains, causes of plastic pipe failure in-service and a variety of other questions.

This year’s replies indicate that the gas utility sector continues to work to replace

2005 DISTRIBUTION PIPELINE INCIDENT BY CAUSE

Cause	No. Of Incidents	% Of Total Damages	Property Damages	% Of Total	Fatalities	Injuries
BODY OF PIPE	2	1.9	\$275,000	1.6	0	0
CAR, TRUCK OR OTHER VEHICLE NOT RELATED TO EXCAVATION ACTIVITY	17	16.5	\$1,295,257	22.7	0	8
COMPONENT	3	2.7	\$918,006	5.1	0	0
CORROSION, EXTERNAL	1	0.9	\$111,500	0.6	0	0
EARTH MOVEMENT	2	1.9	\$400,000	2.2	0	0
FIRE/EXPLOSION AS PRIMARY CAUSE	23	20.9	\$1,862,742	26.9	0	1
HEAVY RAINS/FLOODS	2	1.9	\$721,115	7	0	0
HIGH WINDS	1	0.9	\$55,000	0.3	0	0
INCORRECT OPERATION	1	0.9	\$68,970	0.7	0	0
JOINT	1	0.9	\$49,000	0.3	0	1
LIGHTNING	1	0.9	\$401,100	2.2	0	0
MALFUNCTION OF CONTROL/RELIEF EQUIPMENT	1	0.9	\$128,585	0.7	0	0
MISCELLANEOUS	9	8.2	\$1,078,237	6	0	6
OPERATION EXCAVATION DAMAGE	1	0.9	\$75,000	0.4	0	1
OTHER	0	0	\$0	0	0	0
TEMPERATURE	2	1.9	\$150,000	0.8	0	0
THIRD PARTY EXCAVATION DAMAGE	33	30	\$2,858,469	15.8	0	3
UNKNOWN	9	8.2	\$1,605,100	8.9	1	6
VANDALISM	1	0.9	\$70,000	0.7	2	2
2005 Total (1/1/2005 to 12/31/2005)	110	100	\$18,110,131	100	3	28
AVERAGE		154,638	0	0		

Note: FY 2005 data continues to be updated as the reports are finalized by LDCs. Percentages may change as O&G increases (e.g. energy infrastructure or investment).

Comparison of Pipeline Incident Totals

2004 Total	172	100	\$18,283,906	100	13	41
2005 Total (Thru 8/22/05)	110	100	\$18,110,131	100	3	28

Source: Office of Pipeline Safety



leaking, structurally deficient and older steel and cast iron mains and services. Over 60 percent of those responding said they have no cast iron in existing systems and 54 percent indicated all bare steel had been removed as well. Those with ongoing replacement programs provided completion dates that ranged from 2010 to 2050.

Almost exclusively, respondents say the bare steel in systems is being replaced with PE.

A gas utility in Missouri that serves 920,000 customers says its pipe replacement program dates back to the 1980s. Within the next three years the company plans to have all remaining cast iron/bare steel in its system replaced. Replacement selections are based on leak frequency.

A utility with just over 950,000 customers said it also initiated its replacement program in the early 1980s and relies on risk rankings of all cast iron segments and systematically replaces them by order of risk.

To deal with cast iron and bare steel pipe repairs in its system the company relies on replacements, insertion, clamps and split sleeves. Other techniques being used by utilities include internal lining techniques, Clock Spring's composite sleeve reinforcement system, in-line inspections/cameras, and tethered pig runs.

Plastic pipe failure

Replies to this question indicate that for the most part those surveyed have not experienced a high level of failure in plastic pipe in-service. The majority of those who had experienced problems said the failure was due to a third party.

Industry statistics bear this out and the ability to detect construction equipment entering a pipeline right-of-way (before it can damage the pipeline) would greatly reduce third-party damage

Main costs

The latest figures indicate that 2-, 3- and 4-inch diameter PE pipe is being widely used

by gas utilities and now accounts for as much as 95 percent of all new main installations in developed areas. As to costs, the following figures reflect the average cost per foot by pipe diameter to install plastic and steel mains. Plastic main installation costs ranged from \$2.05-6.50 for 2-inch; \$7-12.95 for 3-inch; \$2.44-13 for 4-inch; and \$4.92-15 for 6-inch.

Companies responding to the survey provided the following steel main installation costs: \$5-16 for 2-inch; \$7.50-18 for 3-inch; \$10-20.50 for 4-inch; and \$14-22 for 6-inch.

Leaky main repair costs

Again, respondents indicated that providing costs to find and repair leaky mains is no easy task. The majority of the costs reported did not identify pipe diameters. Instead, the following were given as the highest cost for finding and repairing leaky mains, regardless of size; \$705 to \$4,285.

One LDC with 1.6 million customers gave \$729 as its average cost of finding and repairing leaky mains, regardless of size.

A gas utility in Louisiana with 4,259 customers that provided costs by pipe diameter said the following represented its average costs for finding and repairing leaky mains: 2-inch \$185; 4-inch \$275 and 6-inch \$430.

Fusion technology

For several years, LDCs' comments to our survey question on fusion technology indicate they are knowledgeable about the benefits of both butt-fusion and electrofusion techniques. Moreover, just over 90 percent of this year's respondents say they are successfully using electrofusion for repairs, service taps, making live-main tie-ins and to work in confined or tight spaces.

Survey respondents are also quick to point out that they have had good results with butt-fusion as well. Typically, LDCs reporting butt-fusion problems say it was due to operator error.

Work by contractors

Survey participants have reported for several years that contractors continue to perform most of the new distribution construction to install gas utilities and this year is no different. Of the gas utilities surveyed, 67 percent reported using contractors to conduct all new construction on projects, while 25 percent reported relying on contractors to perform 25-75 percent of such work. Of the remaining 8 percent, 4 percent reported using contractors to perform 20 percent of their work and 4 percent said they didn't use contractors at all. ■

**Gas Industry
Miles of Main, By Type
1990-2003
(Thousands)**

Year	Distribution Mains
1990	861.6
1991	891.4
1992	892.1
1993	951.0
1994	955.6
1995	949.0
1996	1001.8
1997	1003.1
1998	1022.1
1999	1007.5
2000	1015.6
2001	1099.5
2002	1079.6
2003	1097.0
Steel	553.1
Plastic	501.2
Other	43.8



Dennis Jarnecke, principal project manager of distribution programs at the Gas Technology Institute (GTI), concurs. Jarnecke said his discussions with utilities revealed that as a result of lagging polyethylene production capacity following Hurricane Katrina, about 20 percent of the PE pipe product is not reaching the contractor at this time.

Jarnecke is quick to note that this is not a complete shutdown of the supply chain and he expects to see no more than about a six-month curtailment. He also said plastic pipe prices had risen, but not too high. "This makes it hard to determine if the price increase is due to the higher cost of oil or the shortage itself."

As to PE pipe demand at this time, Stephen Boros, technical director at the Plastics Pipe Institute, says demand for polyethylene gas pipe remains steady.

The PPI spokesman said there seems to be more interest in larger diameter plastic mains as higher capacity is needed to carry gas to expanding populations. New installations are tied closely to new housing starts.

In addition, Boros said the demand for polyethylene gas pipe to replace the pipe damaged due to the hurricanes does not appear to be severe. "The polyethylene pipe is a real success story. PE mains and services had very little damage due to its excellent toughness and fully restrained joints. Even where the pipe was fully exposed, it was still functional. There was more damage to older traditional piping systems that are more brittle and do not have restrained joints that could not endure the soils shifts. This same experience has been seen in earthquakes and the recent tsunamis."

Boros noted that there are other plastics being considered for gas applications. Polyethylene remains the dominant choice for the mains and services market. Polyamide is being promoted for medium pressure systems to replace steel lines operating from 150-300 psi. There is currently a petition before DOT to recognize this material in the Federal Code. Cross-linked PE (PEX) is also being developed for possible use in gas distribution systems. Its main advantage would be in very rocky soils where some other plastics may need special backfill and such. It will not be used in high pressure applications as its pressure capabilities are no higher than for PE.

Post Katrina problems

Utilities are experiencing shortages of meters and leak survey equipment. Natural gas utilities affected by Hurricanes Katrina and Rita have made a plea for leak survey equipment. In response, Las Vegas-based Southwest Gas donated more than 500 hand-held leak survey instruments the company recently retired from service. Valued at approximately \$500,000, these instruments are used to detect underground natural gas leaks.

"With several feet of debris and water remaining in the areas devastated by the hurricanes, it was difficult for our sister utilities to locate and repair damage to their pipelines," said Southwest Gas CEO Jeff Shaw. "In addition, much of their equipment had been either lost or damaged. Because we were in the process of determining the future use of this retired equipment when Hurricane Katrina hit, we were able to respond to the call for help."

Prior to shipping the instruments and their related calibration equipment and operating manuals, Southwest Gas technicians refurbished the instruments and replaced the batteries and filters. In addition, three Southwest Gas employees traveled to Louisiana and Mississippi to train local utility personnel on the calibration and use of this particular model of leak-

Year	No. of Records	Distribution Main Mileage	Distribution No. of Service	Distribution Estimated Service Miles
1984	1,539	750,168	41,258,209	454,200
1985	1,613	784,857	44,809,528	498,697
1986	1,662	780,401	45,056,243	472,555
1987	1,542	802,335	45,848,565	512,960
1988	1,690	866,639	49,246,873	501,861
1989	1,558	836,237	47,591,004	544,450
1990	1,504	945,964	49,755,074	566,763
1991	1,503	950,076	52,665,539	509,345
1992	1,575	981,984	53,103,871	591,109
1993	1,570	951,750	52,009,967	597,917
1994	1,535	1,022,689	55,216,569	655,091
1995	1,524	1,003,796	55,519,341	669,748
1996	1,481	982,860	57,641,200	651,869
1997	1,406	1,002,942	54,865,221	640,800
1998	1,458	1,040,785	55,755,294	666,722
1999	1,403	1,035,946	53,538,415	607,503
2000	1,445	1,050,802	57,690,469	675,064
2001	1,440	1,101,402	59,415,200	720,049
2002	1,423	1,136,711	59,905,938	748,869
2003	1,427	1,087,872	59,791,239	754,046
2004	1,872	1,457,780	81,992,232	970,537

survey equipment.

A third and final shipment to Alabama was delivered in early November.

"In addition to the equipment damaged during the hurricane," Shaw said, "Entergy, the natural gas utility that serves the New Orleans area, lost 40 of its field vehicles. We are currently in discussions with them to determine what type, and how many, of our retired field vehicles would best meet their needs."

Shaw added: "This donation was truly a team effort. We appreciate the efforts of the natural gas associations and public service commissions in Louisiana, Mississippi and Alabama who are spearheading the distribution of this equipment to the municipalities and utilities that need it most, and to Atmos Energy for assisting with training and providing the facilities for the calibration stations."

Safety performance

Rules and regulations covering the design, construction, installation, operation, maintenance, testing, inspection, and safety features of gas distribution systems, including gas storage, metering and regulating stations, mains and services up to the outlet of the customer's meter set assembly are well documented and must be strictly complied to by the LDC.

Recent figures indicate that natural gas utilities spend an estimated \$3.4 billion each year in safety-related activities. Approximately half of that is spent in compliance with federal and state regulations. The remainder is spent voluntarily to ensure the safety of existing systems and communities that the LDC serves.

Utilities also contribute to R&D through organizations where advanced safety devices and technologies are designed and tested.

Not surprisingly, the number and causes of gas distribution accidents are well documented. Records of the recent past indicate that outside force is the largest single cause of pipeline incidents in this sector. Supporting this are incident figures compiled in the