

PG&E's Pipeline Safety Enhancement Plan



American Gas Association
Managing Committee
May 20, 2013

- **PG&E's Pipeline Safety Enhancement Plan**
- **Lessons learned, Insights**
- **Progress to date**



PG&E Gas Operations



★ **Headquarters**
San Ramon, California

Customers (M)

Smart Meters	3.7
Customer Accounts	4.3
Population Served	15

Pipeline Miles

Transmission	6,750
Distribution	42,000
Storage (BCF)	113

Delivery

Delivery (BCF/y)	970
(BCF/d)	2.6
Interstate Connections	
• GTN	
• Ruby	
• Kern River	
• El Paso	



California Regulation

- **Pressure test** or replace transmission pipelines that have not been pressure tested (to CFR 192.619)
 - Prioritize pipeline segments (Class 3 and Class 4, and Class 1 and Class 2 HCA's)
 - Priority rank based on risk assessment
- Propose criteria for **replacement** instead of pressure testing
- Consider retrofitting to allow **in-line inspection** tools
- Propose **automated or remote controlled shut off valves**
- Propose **interim safety enhancement measures** (increased patrols and leak surveys, pressure reductions, and prioritization of pressure testing of critical pipelines)



PG&E Plan 2011-2014

Approved	Not Approved
Pipeline Modernization <ul style="list-style-type: none">Strength Testing - Urban AreasPipeline ReplacementsILI Upgrades and Inspections	<ul style="list-style-type: none">Costs to test Post-1955 linesCosts for lines w/missing records
Records Integration <ul style="list-style-type: none">MAOP ValidationAsset Management System	<ul style="list-style-type: none">Costs for MAOP validation and asset management system
Valve Automation & SCADA	
Interim Safety Measures <ul style="list-style-type: none">Pressure ReductionsIncreased Leak Surveys & Patrols	<ul style="list-style-type: none">Contingency costs for the plan
Total Expense & Capital: \$1.2B	<ul style="list-style-type: none">\$1B



Pipeline Safety Enhancement Plan

1,200 miles of transmission pipeline tested, replaced & retrofitted, and 228 valves to be automated

	2011	2012	2013	2014	Total
Strength Testing*	236	185	204	158	783
Pipeline Replacements	0.3	39	64	82	186
In-line Inspection Upgrades	--	78	121	--	199
In-line Inspections	--	--	78	156	234
Valve Automation	29	46	90	63	228
Records Integration	Data and MAOP Validation for 6.750 Miles				

* *tested or test records validated*



Validate MAOP for every gas transmission pipe component

- Phase 1: Review > 3.7 million documents, > 21 GB data
- Phase 2 : Validate all HCA pipeline segments
 - 1,800 miles, (Method 1) without prior strength test
 - began April 2011, completed February 2012
- Phase 3: Validation of all remaining pipelines
 - 4,950 miles
 - Forecast to be complete Summer 2013
- Effort > 250K man-days



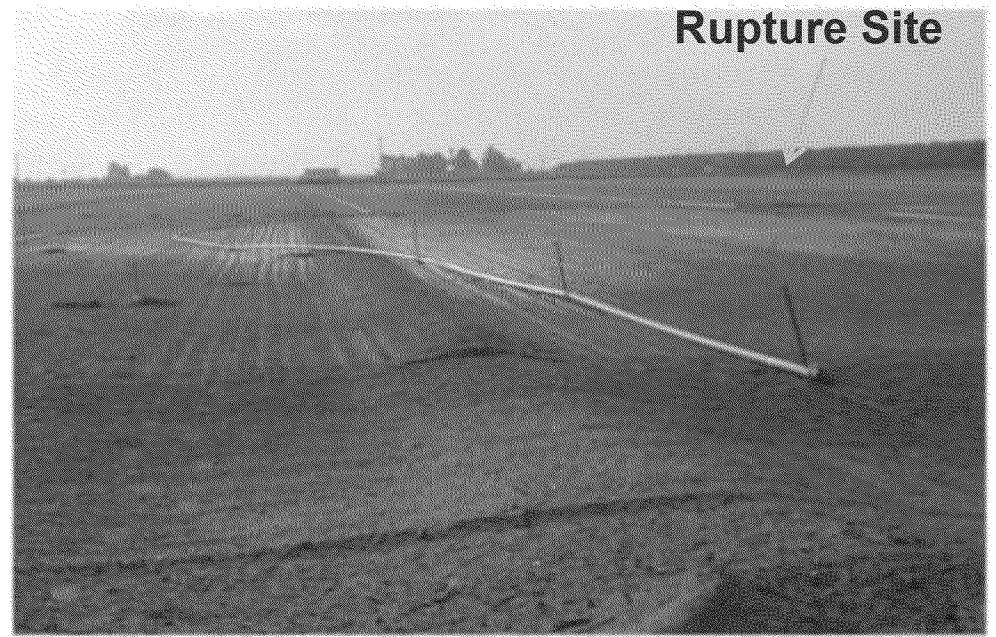
2 years of aggressive pressure testing, 2011-12

- 338 miles
- Over 193 separate tests
- 2 ruptures and 4 leaks

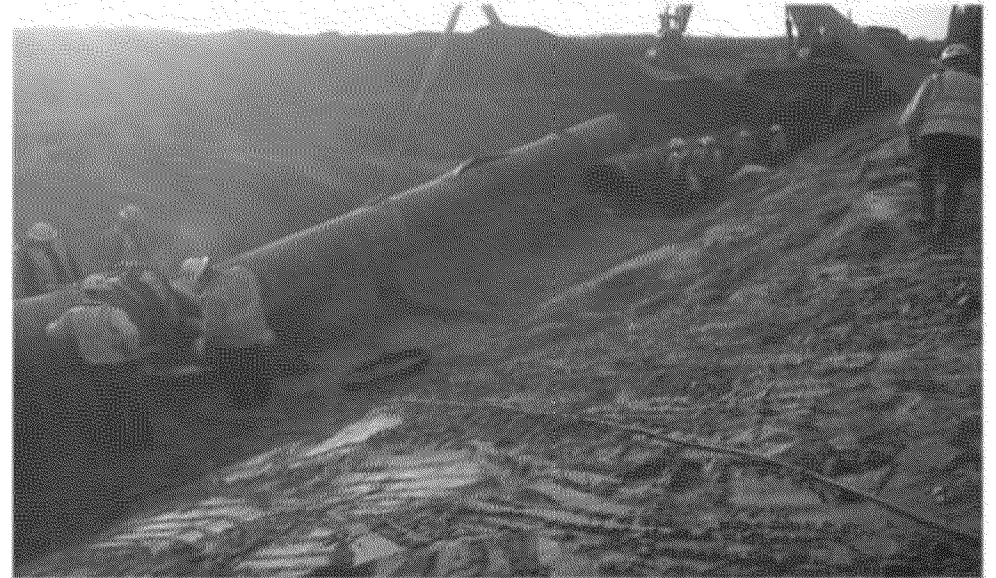


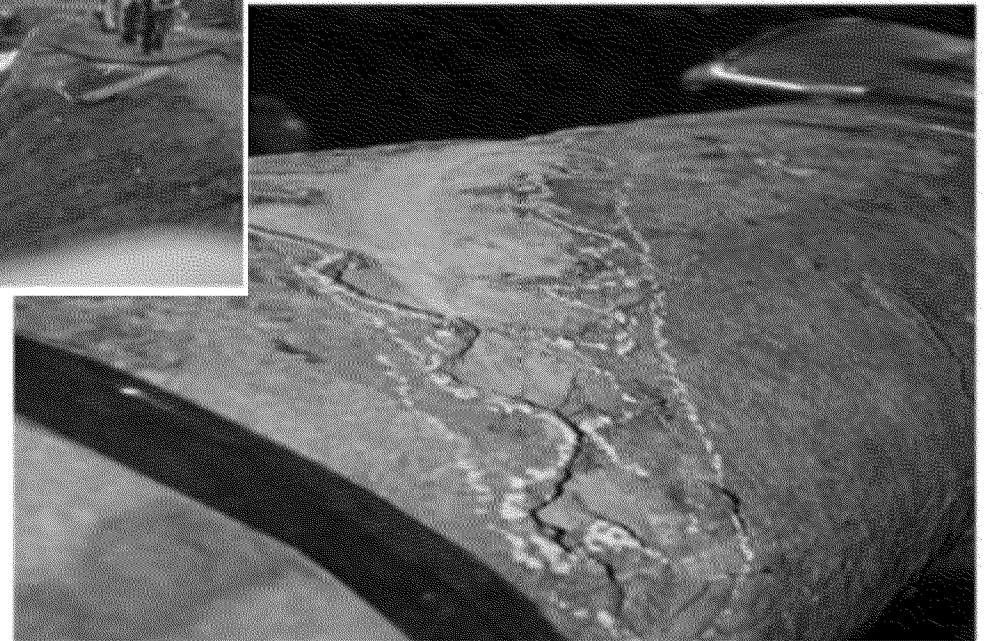
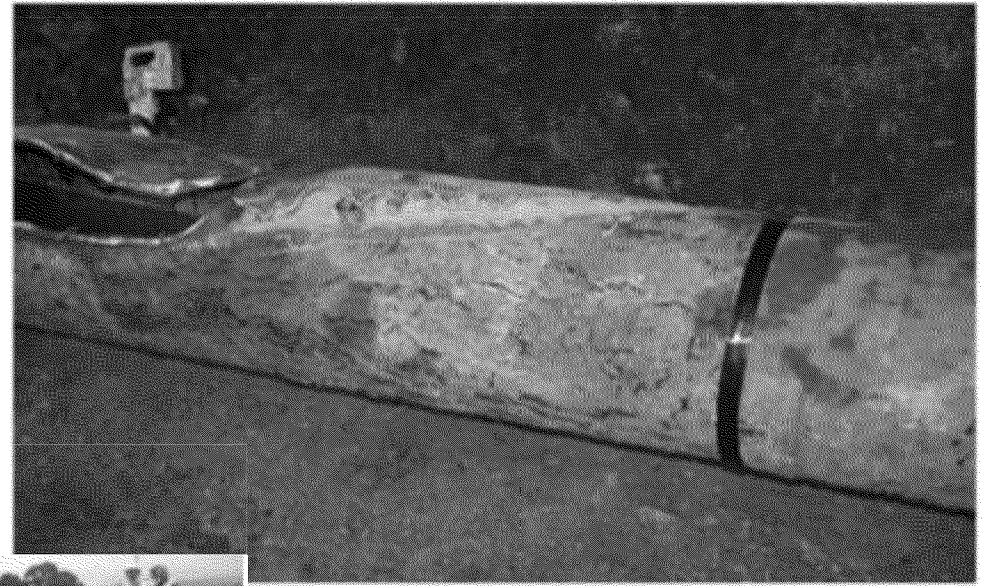
Strength Tests Through December 31, 2012

	2011	2012	Total
Miles Strength Tested	163.6	174.6	338.2
Miles Records Verified	50.9	27.8	78.7
Total Miles	214.5	202.4	416.9
Hydrostatic Tests Completed	97	96	193
Ruptures / Leaks Found	2 / 1	0 / 3	2 / 4
Program Spend (\$M)	\$231 M	\$179 M	\$410
Average Outage Duration (Days)	21	24	
Average Cost per Test (\$M/Test)	\$2.38	\$1.86	
Average Cost per Mile (\$M/Mile)	\$1.41	\$1.03	

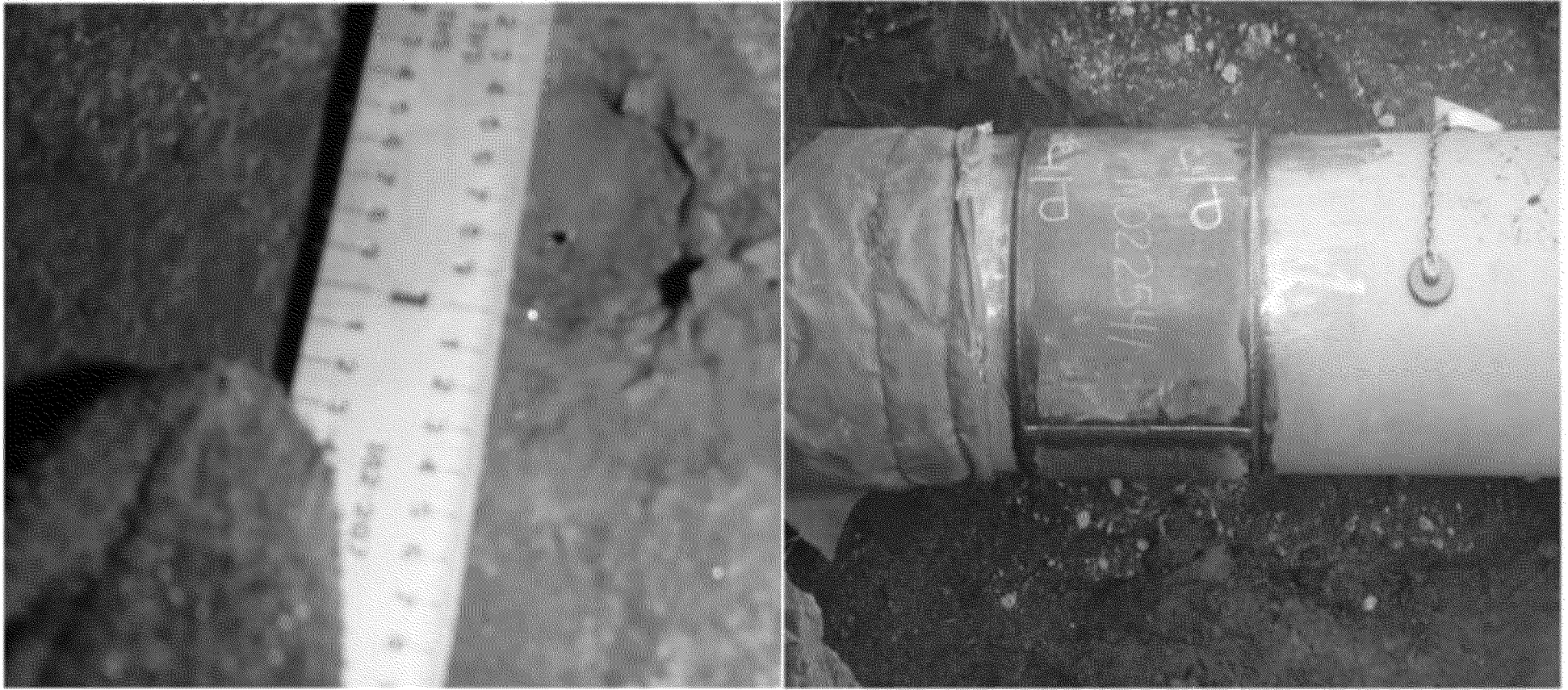


- 998 psig at rupture (757 MAOP)
- Rupture at 95% SMYS
- Seam Failure - Hot Crack and Incomplete Seam weld
- Replaced with 84' of new pipe
- Pipeline passed on re-test





- 550 psig at rupture (400 MAOP)
- External damage
- Replaced with 60' of new pipe
- Passed on re-test



- 525 psig at leak (400 MAOP), Tracer gas used to ID leak location
- Leak caused by corrosion pit
- Repaired by welding full encirclement sleeve on pipe
- Passed on re-test



Strength Tests: Lessons Learned & Insights

PG&E required to prioritize strength testing on Class 3 and HCA pipe segments

- Multiple short tests are very costly
- Urban congestion with limited construction access further increased project costs
- High fixed costs per test, longer tests of 3 to 5 miles are much more cost efficient



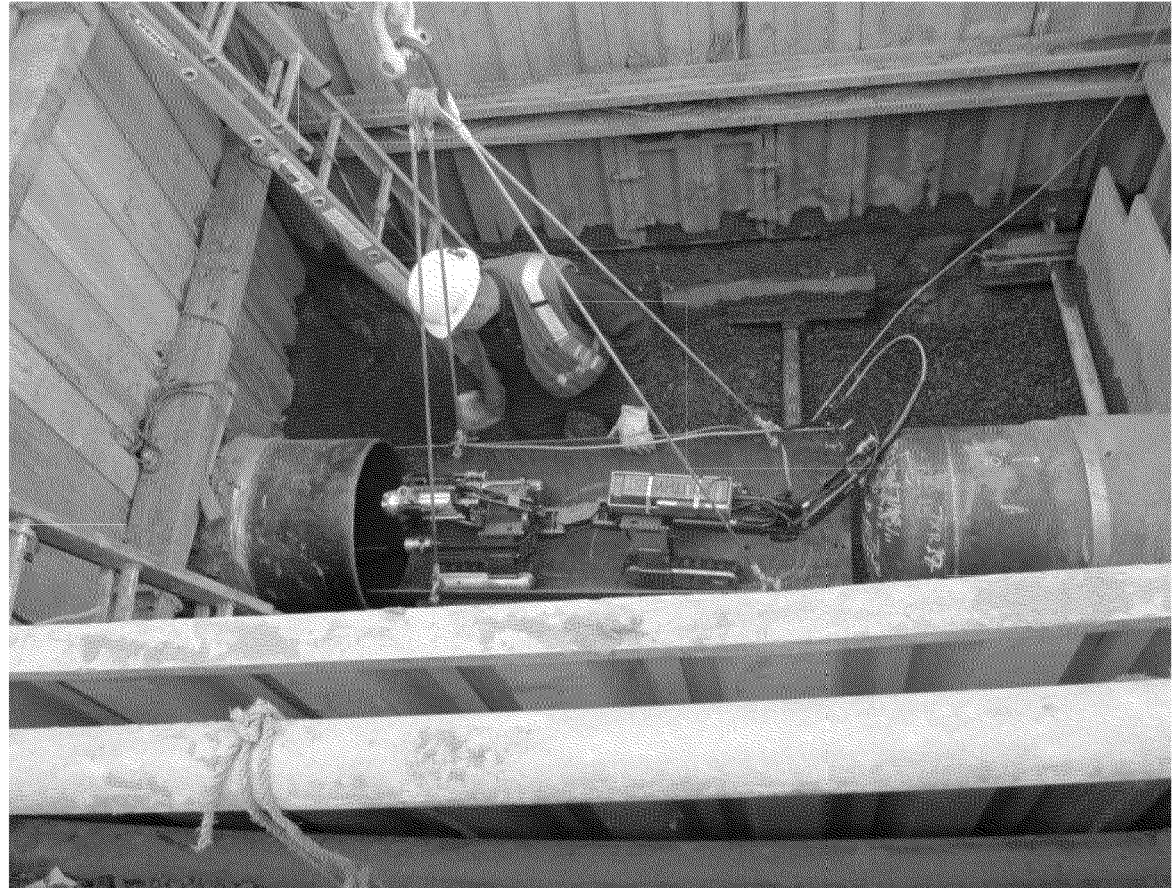
Line 153, Oakland CA (Inspection & Test)

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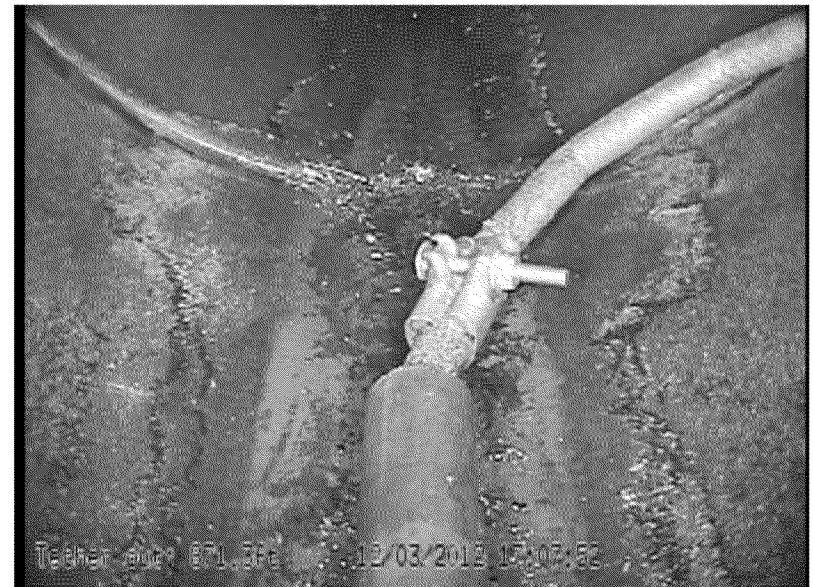
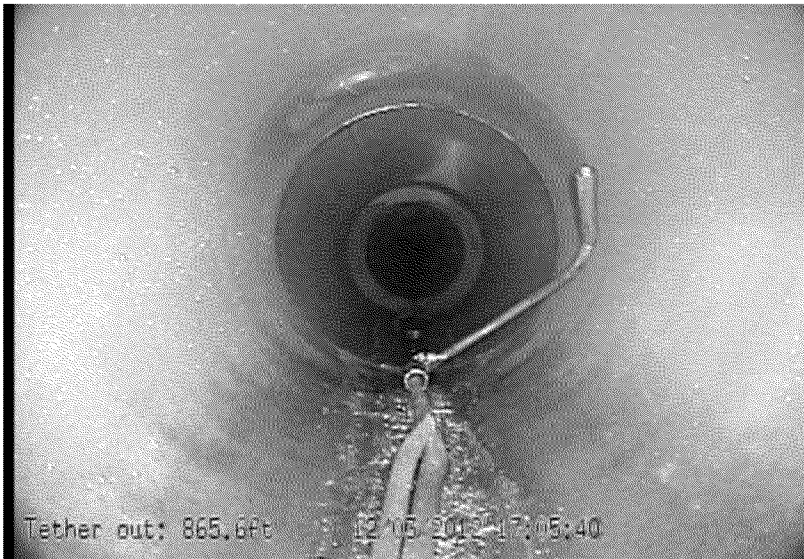
- 1949, 24-inch diameter, 0.3125 wt, Grade B Seamless
- MAOP = 245 psig, 27% SMYS.
- 3 pressure tests, 7.9 miles
- Almost entirely Class 3 HCA

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- Video inspection camera
- Camera & Lights
- Tethered length up to 6000'
- Min. pipe dia. 12"



Un-piggable Features



870 ft. – Cable anchor and tap

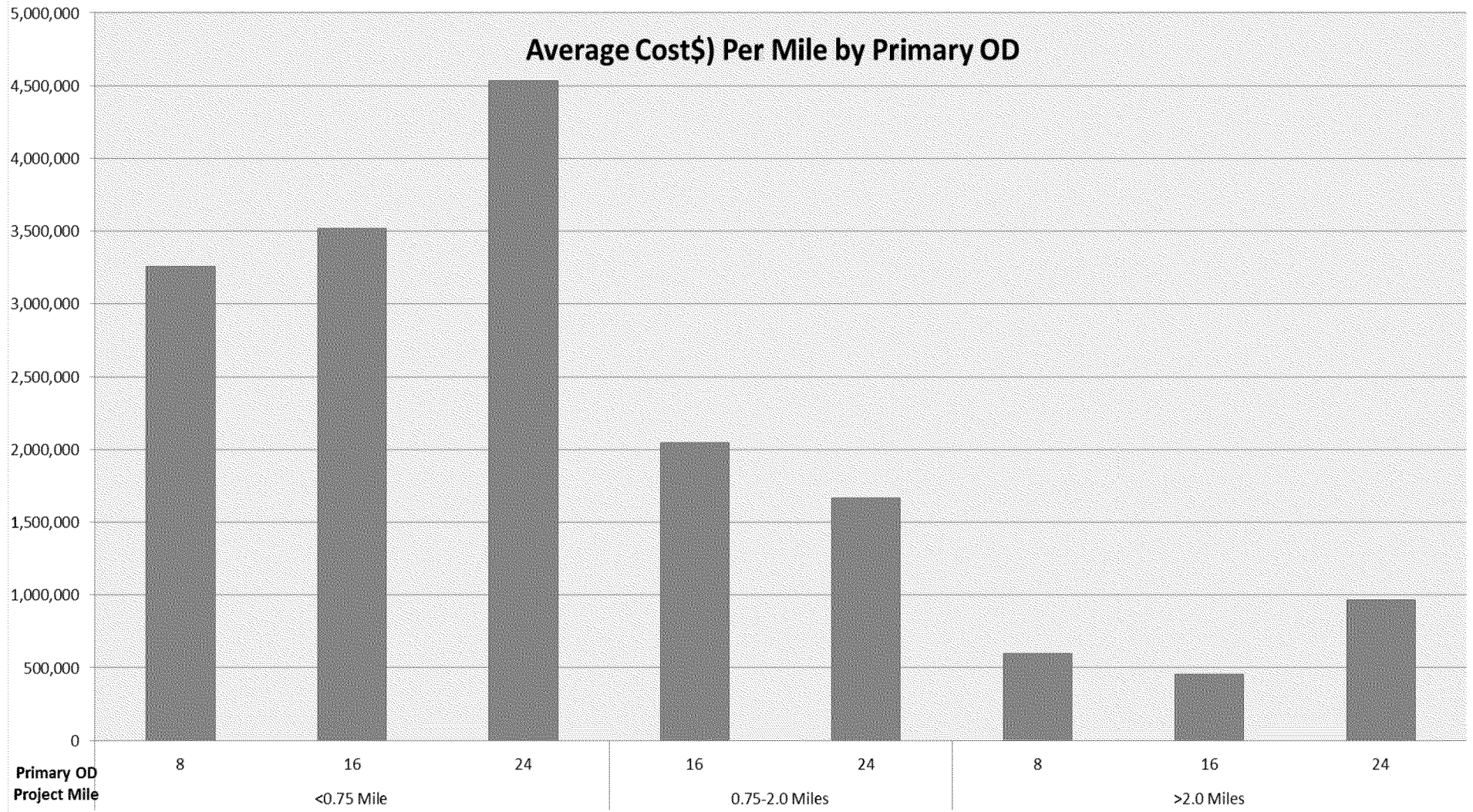
870 ft. – Cable anchor close up

1827 ft. – 30 deg. miter bend and standing liquids



Strength Tests: Lessons Learned & Insights

Test lengths of 3 to 5 miles more cost efficient





Tests must be balanced with maintaining Customer Service

- Use of LNG/CNG equipment, bypasses, and splitting tests at large load taps enables pipeline strength testing without interrupting most gas customers
- Significantly expanded our portable LNG/CNG fleet



Portable Equipment Capabilities

	Units			Capacity (scf, scfh)	
	2010	2011	2013	Volume	Flow rate
LNG Tankers	3	3	7	up to 900,000	
LNG Vaporizers	3	7	8		up to 500,000
CNG Tube Trailers	5	8	16	up to 150,000	
CNG Injection Trailers	5	8	10		up to 50,000
CNG Gaps	2	8	15	up to 17,000	2,000
CNG Modules	0	0	90	2,200	500
CNG Bottle Trailers	4	26	26	1,800	500
CNG Module Regulators	0	0	2		2,000
TOTAL	22	60	174		



LNG Equipment (tankers, vaporizers, compressors)

Napa Valley





CNG Tube Trailer, 68-150 Mscf





CNG Gap Trailer, 17 Mscf





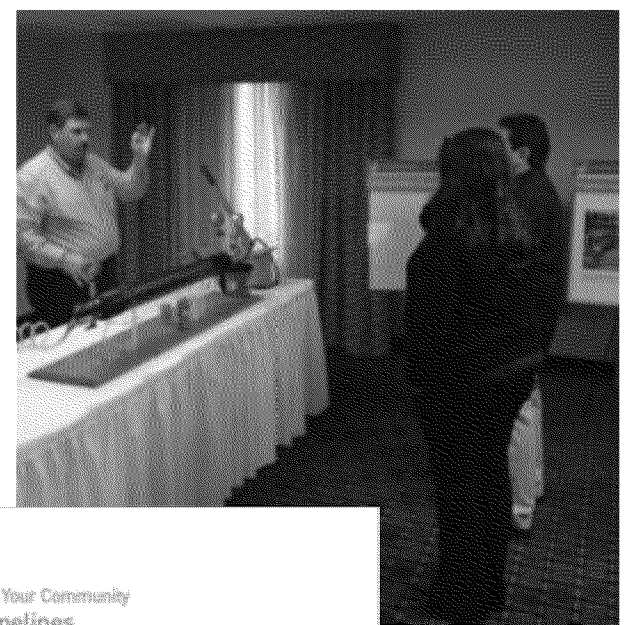
Communications- Lessons Learned & Insights

- Involve Customer and Government Relations to improve communication with local cities and customers, and to speed permitting
- Minimize customer concerns by communicating often (2012):
 - 178,004 customer letters
 - 500,027 automated phone messages
 - 67 community “open houses”
- Customers feel safer following pressure testing
 -



Community Open House

- Exhibit boards
- Fact sheets



Pipeline Safety in My Community

Regional Map: Bakersfield

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Pipeline Safety in Your Community Replacing Pipelines

As part of our robust, multi-year program to improve the safety of our natural gas system, Pacific Gas and Electric Company (PG&E) is replacing portions of our large transmission pipelines. In their place, we're installing new pipelines using industry recognized and proven installation techniques.

What are we doing?

PG&E is identifying the transmission pipelines in our gas network that need to be replaced. Some of these lines were installed decades ago, before the benefits of modern manufacturing and construction techniques. Pipeline replacement involves the following steps:

1. **Identify the locations.** PG&E coordinates with local government agencies and adjacent property owners.
2. **Excavate the line.** PG&E usually excavates the old pipeline by excavating next to, or next to the current line. The new pipeline is then placed in the ground.
3. **Install and test.** Throughout the installation, crews repair the new pipelines with newly advanced joint technology. We also test the pipe with high-pressure water to verify its safety and strength before it goes into service.
4. **Connect to the system.** When the new pipeline is safely in place, we close the old pipe out of service and reconnect the new line to the system.

What to do next:

You will see PG&E trucks and other heavy equipment in your neighborhood and crews will be performing as needed. When the project is complete, we will coordinate with local agencies and adjacent property owners to address any paving, seeding or landscaping that needs to be done.

Customer notice: Your gas service will continue without interruption. If that changes, a PG&E representative will contact you.

On the day the old pipeline is taken out of service: Customers may notice gas or hear a loud sound when we turn the gas to safety someone from the pipe. This is normal. Our customers are advised to call us at 1-800-735-7353 with any safety concerns.



Construction Site Signs

Pipeline Safety in Your Community

Automating gas shut-off valves:
Improving PG&E response time
to stop the flow of gas

Thank you for your patience while we work as quickly
and safely as possible.

Contact us with
questions or concerns

- To learn about PG&E's natural gas system, visit www.pge.com/gas
- For information on pipeline safety programs, call our Gas System Help Line at 1-888-743-7431
- For general questions, call our Customer Service Line at 1-800-743-5000



Pipeline Safety in Your Community

Natural Gas Pipeline Replacement
Building a safer, stronger natural gas system



www.pge.com/gas

Pipeline Safety in Your Community

PG&E Gas Safety Project

Hydrostatic Pressure Testing
Verifying the safe pipeline
operating pressure and identifying
any areas for repair

Thank you for your patience while we
work as quickly and safely as possible.

Contact us with questions or concerns

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- For general questions, call our Customer Service Line at 1-800-743-5000 at any time



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Status Q1 2013

	Q1 2013	Total Year
Strength Testing (Miles)	15	204
Pipe Replacement (Miles)	5	64
ILI Retrofits / Inspections (Miles)	16.4 / 0	121 / 78
Valve Automation (Valves)	8	75