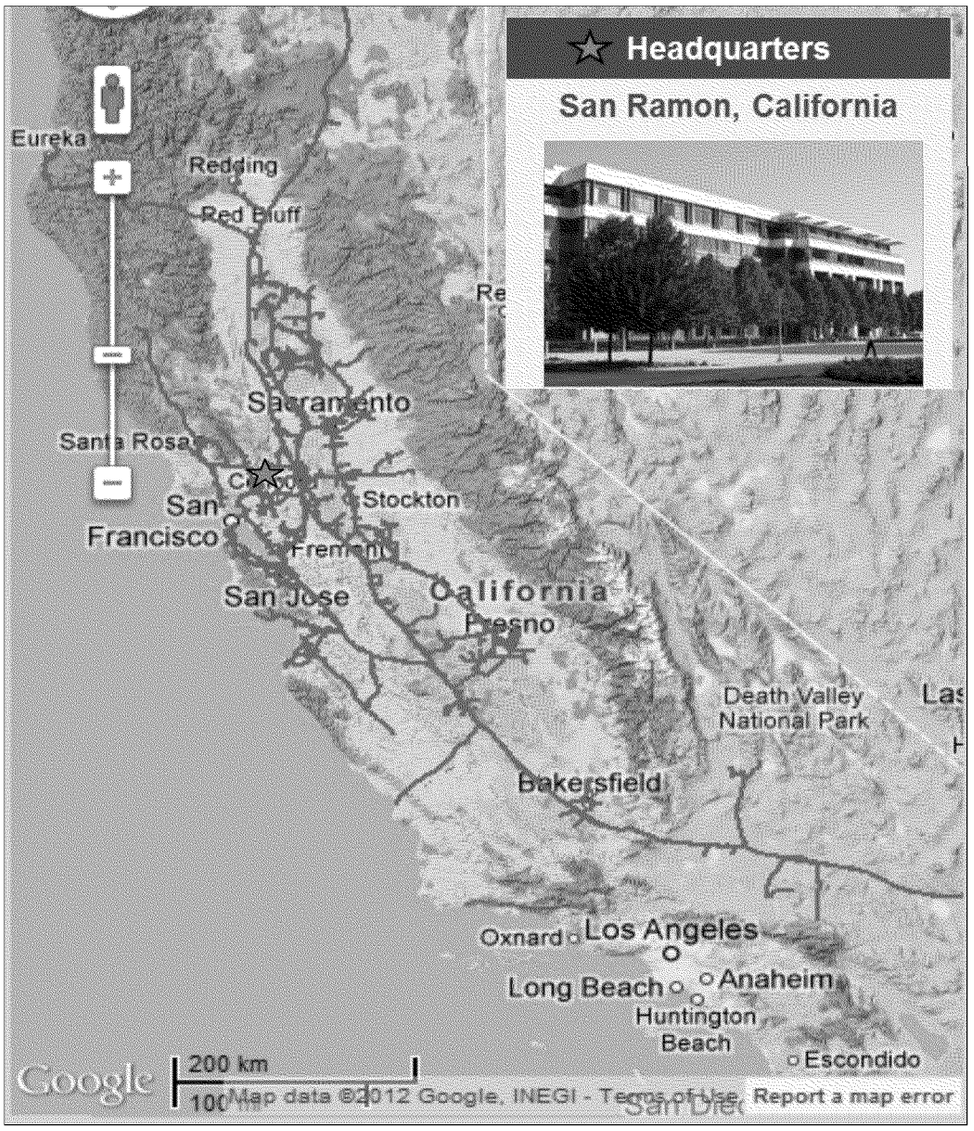
PG&E's Pipeline Safety Enhancement Plan

American Gas Association
Managing Committee
May 20, 2013

Agenda

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

PG&E Gas Operations



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 • Strength Testing - Urban Areas • Pipeline Replacements • ILI Upgrades and Inspections	• Costs to test Post-1955 lines • Costs for lines w/missing records
Records Integration • MAOP Validation • Asset Management System	• Costs for MAOP validation and asset management system
Valve Automation & SCADA	
Interim Safety Measures • Pressure Reductions • Increased Leak Surveys & Patrols	• Contingency costs for the plan
Total Expense & Capital: $1.2B	• $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*

MAOP Validation

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

Strength Testing

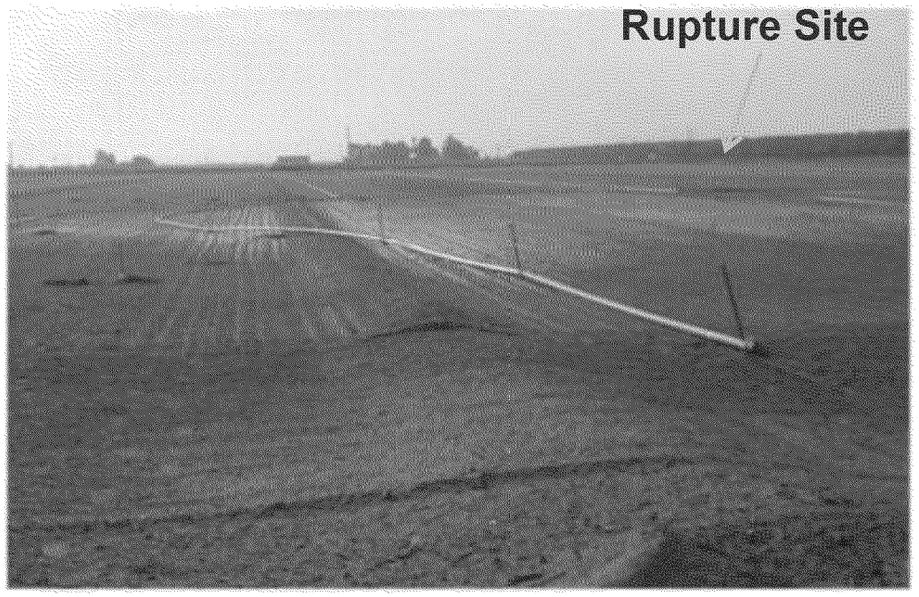
2 years of aggressive pressure testing, 2011-12

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

Strength Tests Through December 31, 2012

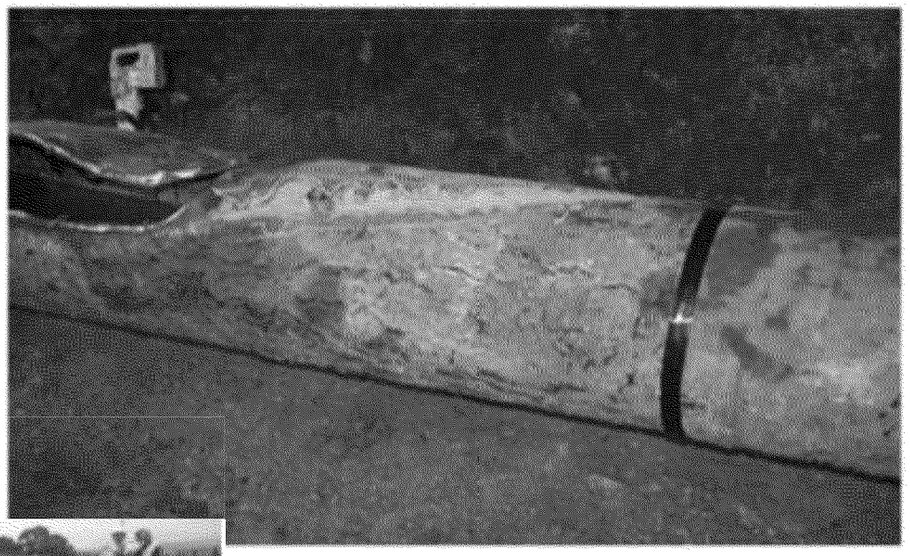
	2011	2012	Total
Miles Strength Tested	163.6	174.6	338.2
Miles Records Verified	50.9	27.8	78.7
Total Miles	214.5	202.4	416.9
Hydrostatic Tests Completed	97	96	193
Ruptures / Leaks Found	2 / 1	0 / 3	2 / 4
Program Spend ($M)	$231 M	$179 M	$410
Average Outage Duration (Days)	21	24	
Average Cost per Test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

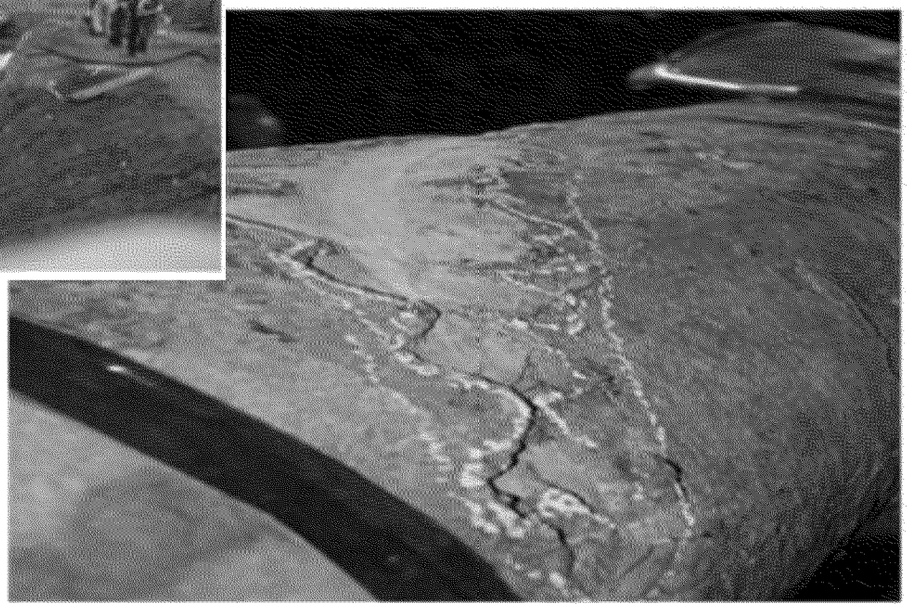
2011 Test: Line 300B Rupture, Bakersfield



- 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

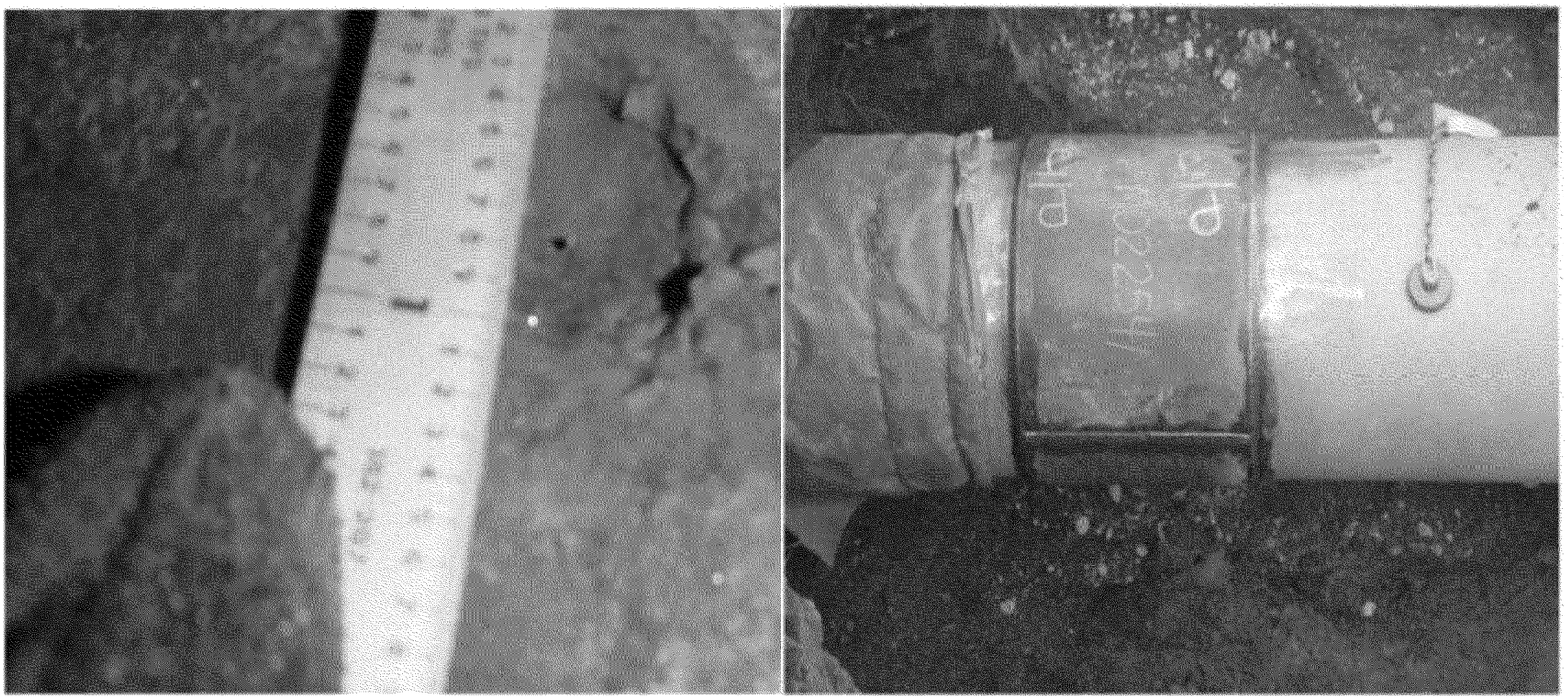
2011 Test: Line 132 Rupture, Woodside





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

2011 Test: Line 132 Leak, Palo Alto



- 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)

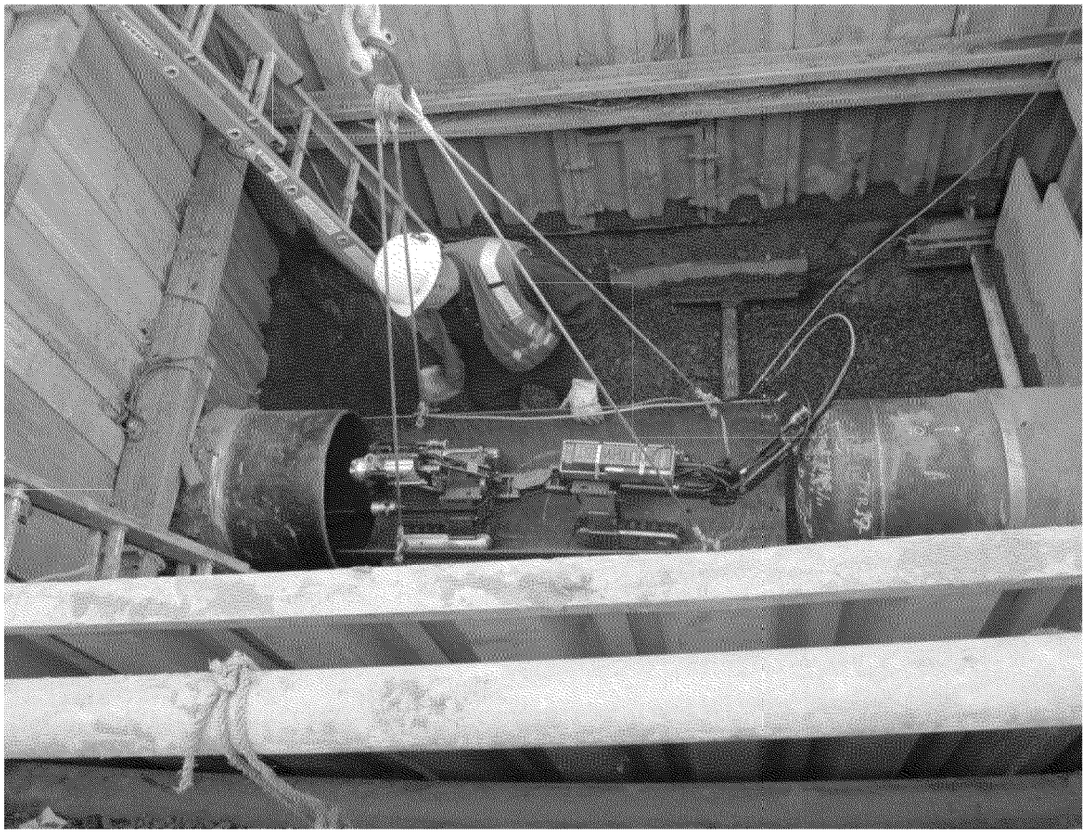
Redacted

- 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

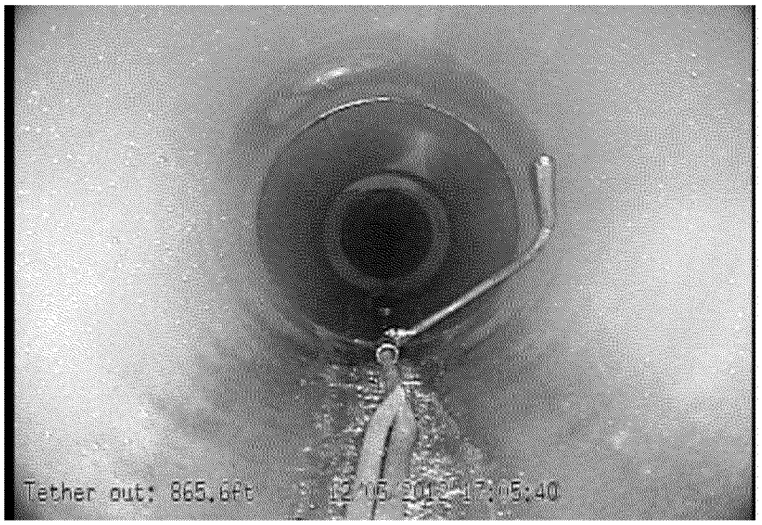
Redacted

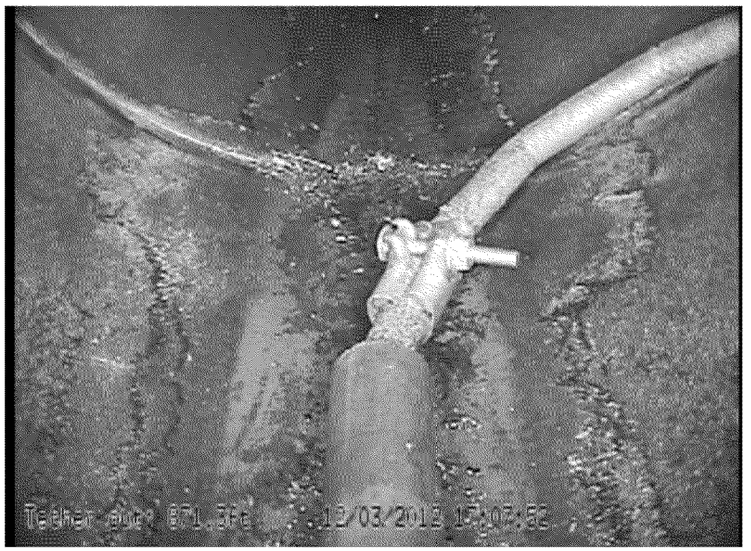
Video Camera Inspection

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



Un-piggable Features



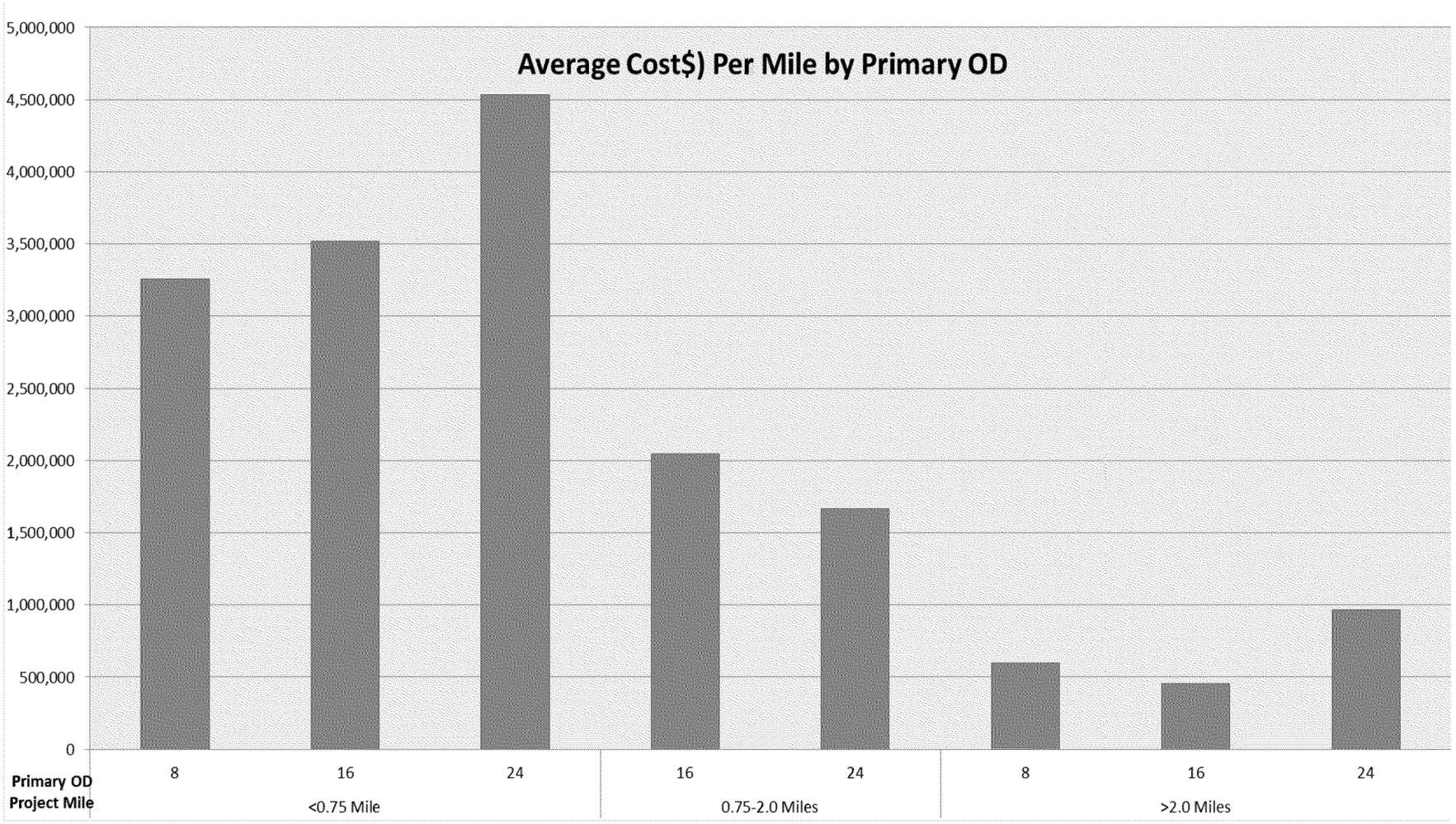


870 ft. – Cable anchor and tap

870 ft. – Cable anchor close up

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

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

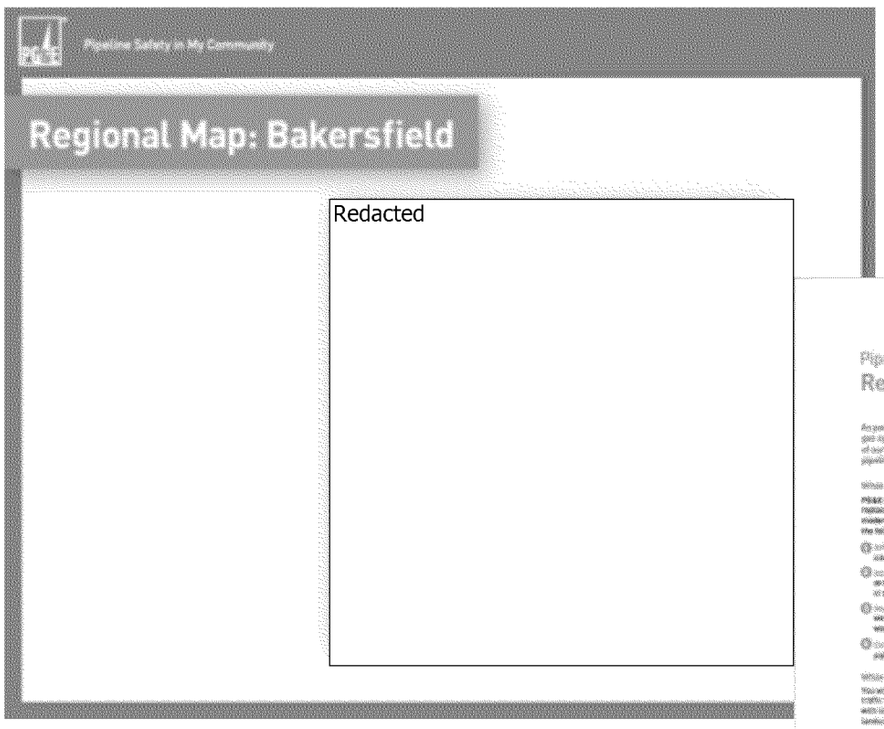
- Involve Customer and Government Relations to improve communication with local cities and customers, and to speed permitting

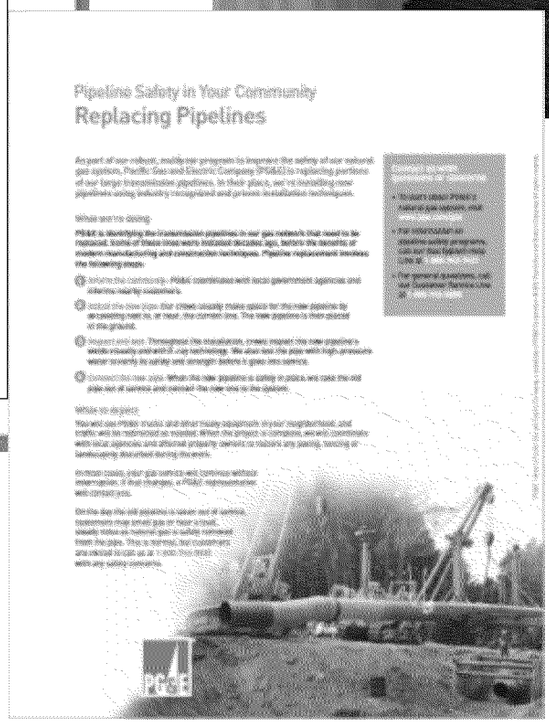
- Minimize customer concerns by communicating often (2012):
  - 178,004 customer letters
  - 500,027 automated phone messages
  - 67 community “open houses”

- Customers feel safer following pressure testing
  -

Community Open House

- Exhibit boards
- Fact sheets





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

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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.

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

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