Beyond compliance
Creating a new norm in gas pipeline leak management

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pwc

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Introduction

The focus on pipeline safety has never been greater than it is today. New and revised regulations are elevating pipeline safety requirements—grandfathered pipe is being eliminated, for example, and integrity management requirements are being expanded in CFR Title 49. In addition, events such as the March 2014 building collapse in New York City are fueling public demands for heightened safeguards.

There is no silver bullet for mitigating the risks associated with aging gas pipelines in this country. Most states have approved recovery mechanisms for accelerated pipeline replacement, and utilities are taking advantage of these incentives to replace their most at-risk pipe. Even so, pipeline replacement efforts will take decades, which means these efforts alone cannot meet the pressing need for gas pipeline safety improvement.

Leak survey and repair must be a critical component of a complete pipeline safety solution. There is a rub, however. All too often, leak survey is viewed as a compliance activity rather than as a core element of pipeline integrity management.

Utilities that move away from the passive compliance mindset toward a proactive safety culture can transform leak management into a core driver of pipeline safety—a catalyst to set the bar higher, to embed pipeline safety in daily practice, and to achieve a "new norm" in leak management.

In the new norm, leak survey is no longer viewed simply as a compliance activity—it is integrated with risk assessment, work identification, and investment planning to transform integrity management and enhance pipeline safety.

Advanced leak detection technology, which is three orders of magnitude more sensitive than current methods, enables the forging of this new role for leak survey. Deploying the technology, however, presents challenges that may inhibit utilities from reaping significant benefits and achieving a step-change improvement in pipeline safety. Adoption is far from "plug and play"—process redesign, systems integration, and change management are required.

The question before utilities therefore is: How to effectively deploy the new technology to position leak survey as a key enabler of pipeline safety and achieve a new norm in leak management?

What does the new norm in leak management look like?

To understand the future of leak management, we start with an illustration of the current state of leak detection at most local distribution companies (LDCs). Figure 1 shows that the leaks found by survey (L_S) and from customer calls (L_C) combine to identify the total number of leaks found in the system (L_T).

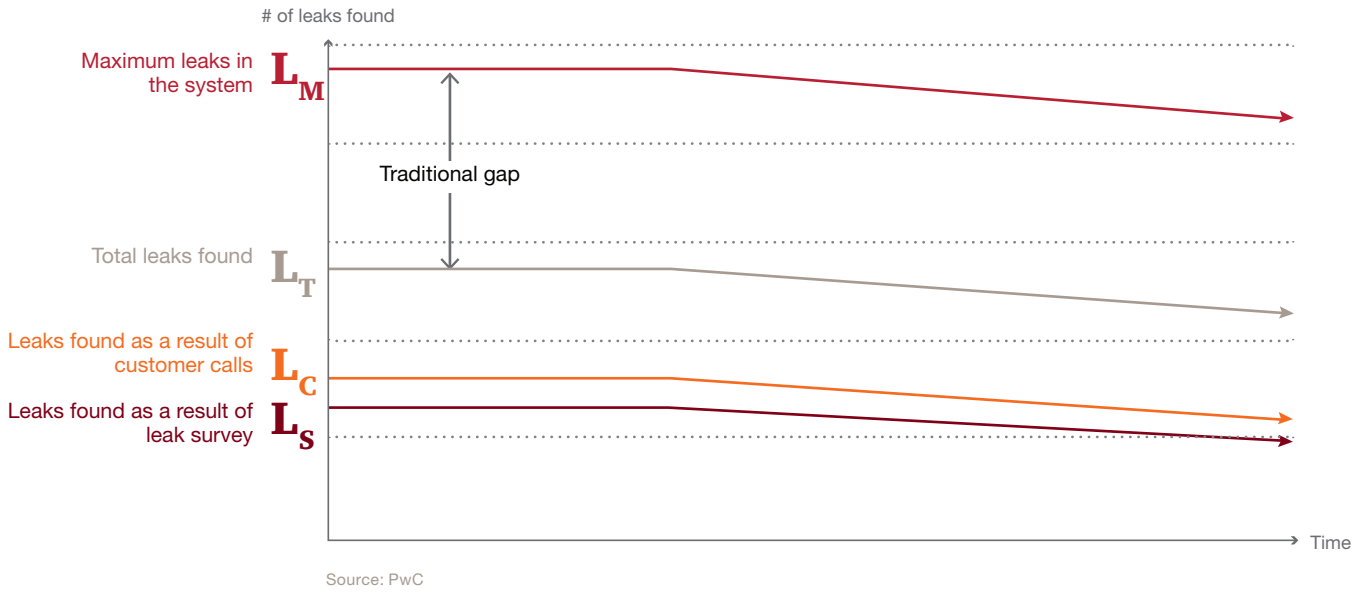
The problem is that no one knows how many leaks are actually in the system (L_M). Traditional approaches and technologies simply fail to detect many existing leaks. Ideally, leaks would be mostly discovered by survey, with occasional calls from customers. In reality, the reverse is more typical—customer gas odor calls identify more leaks than are found by leak survey.

Utilities recognize there is a big gap between L_T and L_M, particularly in older cities—and that the large number of unfound leaks represents a significant risk.

To address this gap, utilities have been focusing on pipeline replacement as a way to decrease the maximum leaks in the system, L_M. These projects, however, are capital- and time-intensive, and they address only a small percentage of the total pipeline assets. LDCs typically do not have the tools to quantify the safety benefit from replacing pipeline. Nor can they prove that they are narrowing the gap between the number of leaks that exist and the number that have been repaired or replaced.

Advanced leak detection technology can be a game changer for leak management. Utilities can leverage advanced leak detection technologies to reduce the gap and promote safety (see Figure 2). In the new norm—highlighted by the lower-right oval in the figure—utilities may find leaks at almost the same rate at which leaks form. Further, the gap between found leaks and actual leaks could shrink by up to 90%.

Figure 1. Current state of gas utility leak management



Source: PwC

"Odorization has essentially become the first line of defense for detecting leaks. We are aggressively challenging this paradigm and looking for new technologies to improve safety and make customer-reported leaks the minority of leaks repaired."

–Tal Centers, VP Engineering and Gas Operations, CenterPoint Energy

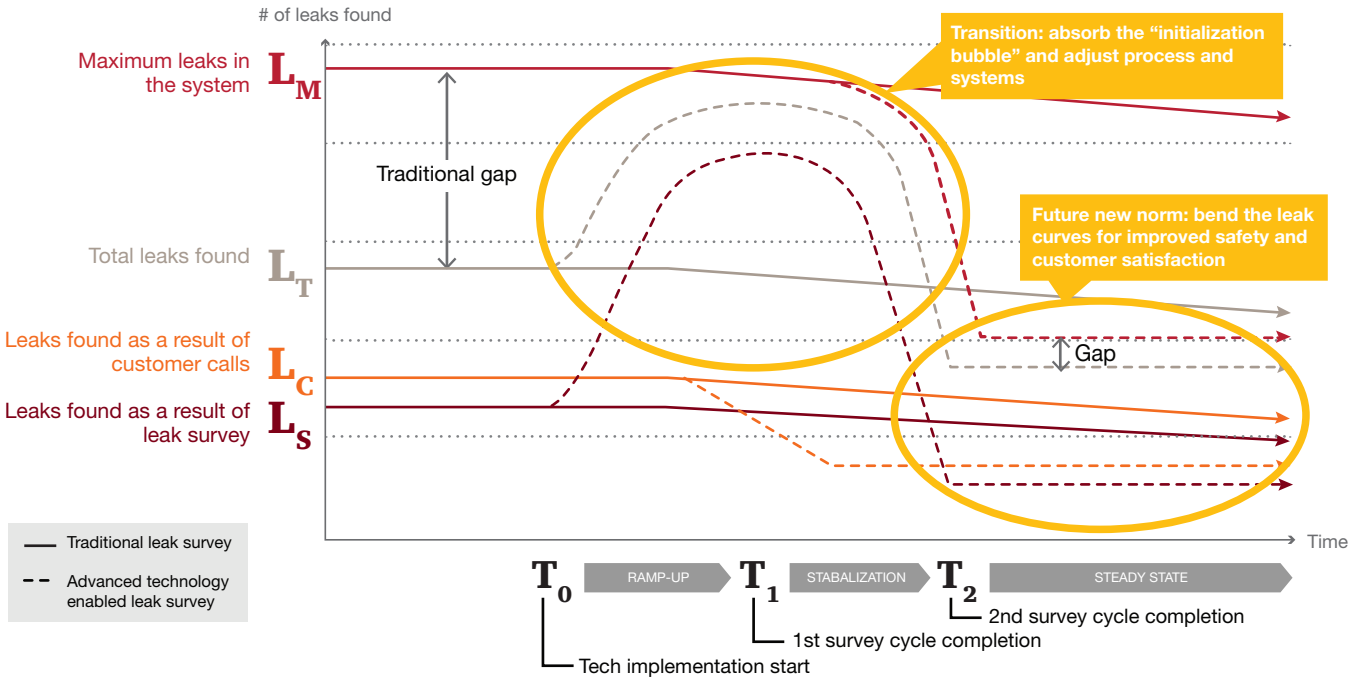
In the new norm, leaks are found earlier. After two to three cycles of leak survey and repair, the total number of leaks and the grade distribution are expected to shift to fewer, smaller, less hazardous leaks. The efficiency of pipeline maintenance tasks, such as leak repair planning, scheduling, and resource utilization, is improved as leak repairs transition from emergency to planned work. Other benefits, such as reduced leak repair costs, lower insurance costs, and higher customer satisfaction, are generally created as well.

To reach the new norm, however, utilities should weather a transition bubble characterized by a high volume of incremental leaks that are found and repaired over multiple survey cycles. In other words, they should plan and prepare for a rapid rampup in the volume of leaks (dotted L_S line). With so many more leaks identified by survey, the total number of found leaks will also rise (dotted L_T line), even as the volume of leaks reported by customers is reduced (dotted L_C line).

Utilities' success in overcoming the transition bubble and achieving the new norm in leak management will depend on cultivating a culture of safety vigilance, revamping systems and processes, and working with regulators on cost recovery for incremental leak repairs. They should also educate customers, regulators and the public at large on a key message: More leaks is not necessarily bad. The ability to proactively find and fix more leaks defines leaders in pipeline safety.

Initially, a far higher volume of leaks will be discovered with advanced leak detection technology. After that transition bubble is past, the total leak find rate will approach the actual rate of leak formation.

Figure 2. The new normal of leak management



Source: PwC

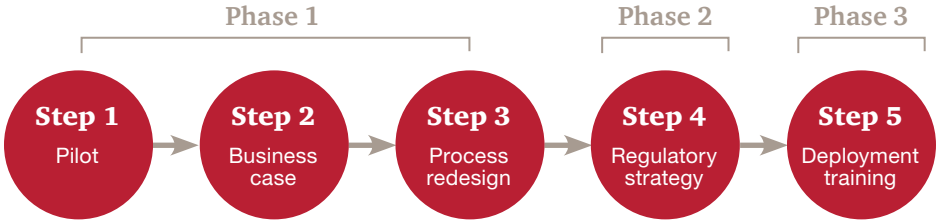
Mapping milestones on the journey

Utilities' journey towards the new norm is chartered by answering these questions:

- What do we need to do to build a pipeline safety-centric culture?
- How high will the leak find rate be in the transition period?
- How long will the transition period of higher leak volume last?
- What process and systems changes should be in place to enable advanced technology, achieve higher efficiency and controls, and handle the higher volume of leaks?
- What incremental resources/costs should be accounted for to address the higher volume of leaks during the transition period?
- How will investments and incremental leak repair costs be recovered?

Previously we detailed a deployment methodology to help utilities address the challenges. (Figure 3).[1] Now we are reporting on a large utility's journey towards the new norm by applying the methodology.

Figure 3. PwC deployment planning methodology for advanced leak detection technology



Case study: Delivering on an organizational commitment to safety-first

CenterPoint Energy, a leading utility operating in six jurisdictions applied our deployment methodology for an enterprise-wide rollout planning. The first phase of the project covered steps 1-3 simultaneously through pilots in two of the LDC's jurisdictions. Piloting the advanced leak detection methodology in different environments (cold and warm) with different processes and systems would lay the groundwork for creating customized deployment plans for all the jurisdictions.

Phase 2 covered the regulatory strategy (step 4 in the methodology), which is essential for winning regulator support for deployment of the advanced technology, while minimizing rate impact on the customers. This phase was focused on defining outreach efforts and deployment timing across all the six jurisdictions

Phase 3 covers deployment planning (step 5 in Figure 3) to help the utility plan an efficient, phased deployment of the advanced technology across six regions.

Phase 1: Understand and prepare for the transition bubble

A critical setup step in Phase 1 was to facilitate the right field representation across the three workstreams (pilot, business case development, and

1. PwC, See PwC, "Next-generation leak-detection technology for safe and reliable energy delivery," http://www.pwc.com/en_US/us/industry/utilities/publications/assets/pwc-next-generations-leak-dection-energy-delivery.pdf

process/systems assessment). To serve as change agents in the field, the utility established cross-functional core teams for each workstream, with representatives from engineering, operations, IT, finance and regulatory.

Pilot: CenterPoint Energy's pilots were intended to identify the height and duration of the transition bubble regardless of regulatory strategy and deployment timeframes. For that purpose, the utility tested the technology in summer and winter conditions in Texas and Minnesota respectively, to evaluate the tool's performance compared to current methods in dramatically different climatic conditions.

Business case development: The utility quantified near-term operating income impact and long-term benefits to enable the executive team to make informed decisions.

As part of that work, the team created a cost model to compare baseline costs and projections with the calculated costs and benefits of deploying advanced technology in different scenarios. Key levers for deployment planning were defined as survey frequency (current versus accelerated), leak repair policy (compliance requirements versus accelerated), extent of deployment (full versus partial on just some asset types), type of deployment (system-wide versus phased), and type of vendor contract (lease versus buy).

Process/system redesign: Limited process and systems changes were needed to deploy the leak detection technology in Texas—only incremental resources were needed for leak survey, repair operations and clerical functions. Minnesota, on the other hand, employed different leak survey technologies and processes for mains and services. Consolidation was required to achieve a single, standardized reconfigured process to deploy the leak detection technology.

The utility also explored how to reduce risk and bump up productivity through improved supervision and audit trail for leak survey compliance. As part of that work, the team maintained all leak survey and repair records in a single system of record (SAP) with linkage to geographic information systems (GIS) and mapping for integrity management, reporting and audit trail.

Table 1. Sample pilot benefits

Advanced leak detection pilot results	Texas	Minnesota
Increase in leak survey find rate	5.7x	5.7x
Estimated reduction in unfound leaks	89%	90%
Total leak management cost reduction	13%	14%
Leak survey productivity improvement	18%	26%
Estimated reduction in customer calls	21%	26%

Phase 1 lessons learned: Both pilots reported >5x improvements in leak find rate and ~20% boosts in productivity—proving that the superior technical performance of the technology led to improved safety and higher operational effectiveness (see Table 1). Despite different test conditions and different climates, Texas and Minnesota showed similar results for several key parameters.

Pilot results help to establish the new norm vision (see Figure 2). The number of unfound leaks—the gap between L_T and L_M in the figure—are indeed expected to drop by 90%. Once the utility weathers the transition bubble, total leak management costs are expected to drop significantly in both regions. As people smell gas less and customer call-ins become less frequent, customer satisfaction scores are also predicted to improve.

A deep dive into the pilot leak find rates dispels the misconception that advanced technology only finds small, above-ground leaks (see Table 2). The pilot studies showed the opposite—advanced technology can identify leaks across grades (A, B, C) and types but is particularly good at detecting hard-to-find below-ground leaks. In this way, the pilots highlighted the safety value proposition compared to traditional methods.

Table 2. Increase in leak survey find rates with advanced technology over traditional methods (by leak grade and type)

Increase in leak survey find rate by leak grade and type			
Leak grade	Above ground leaks (meter + service)	Below ground leaks (meter + service)	**Total**
A	3.6x	9.8x	**6.2x**
B	4.8x	5.5x	**5.1x**
C	8.1x	4.4x	**6.6x**

Note: Grade A leak represents an existing or probable hazard to persons or property, and requires immediate repair or continuous action until the conditions are no longer hazardous. Grade B leak is recognized as being non-hazardous at the time of detection, but justifies scheduled repair based on probable future hazard. Grade C leak is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous.

Phase 2: Charter a regulatory strategy

With the technology proven and benefits identified, CenterPoint Energy turned to developing a regulatory strategy to enable deployment of the technology and achieve the goal of improved pipeline safety. The main objective of this phase was to get regulatory approval to utilize the technology for all leak surveys while minimizing the rate impact on customers.

In this phase, the utility conducted outreach efforts with regulators and has planned similar communications with the public. It was critical to educate these audiences that finding and fixing more leaks in the first cycle of advanced technology deployment was a better, safer choice than accepting a pipeline system with a large number of unfound leaks. These efforts focused on gaining buy-in for phased enterprise-wide deployment and rate recovery, respectively.

Lessons learned: Piloting deployment in two jurisdictions allowed the utility to clearly articulate the value proposition of the advanced technology and hone its communication campaigns.

"We want a safer system, a system with zero safety incidents. Advanced technologies help take us to that next level. In pursuit of perfection, we will achieve safety excellence."

–Tal Centers, VP Engineering and Gas Operations, CenterPoint Energy

Utilities can tailor the initial transition bubble curve to their needs.

Phase 3: Define and embark on a sustainable path towards the new norm

CenterPoint Energy's enterprise-wide deployment plans highlight opportunities for standardizing leak management processes and systems as well as developing a cross-region integrated leak survey schedule that will enable the utility to share advanced technology units and resources needed across regions. The company is focused on gaining synergies and spreading leading practices across regions. It is important to streamline the new activities required by this norm in order to reduce overall operating costs. The efficiencies gained can demonstrate the value of the utility's new leak management norm and improved safety culture.

Defining a repair scheduling process that can batch jobs based on work type and location, for example, can help efficiently handle the increased repair volume with reduced incremental resources. Revising GIS polygons to define leak survey areas, setting up leak survey requirements in SAP asset maintenance plans, and overlaying mapping solution with GIS provides a single system of record for all leak survey/repair work. Leak survey inputs will also be closely tied with integrity management/asset replacement decisions.

The pilot team is developing a deployment planning playbook complete with tools and templates to accelerate and standardize planning across the remaining four jurisdictions. They are also establishing enterprise-wide standards for handling survey reports (e.g., how staff is expected to review leak indications to screen out background noise, false positives, and other sources of methane).

The time is now

Achieving the new norm in leak management is a multiyear journey that must be shaped by senior leadership and embraced by employees. Achieving the new norm means switching from a compliance to a safety culture, which is a far greater challenge than selecting an advanced leak detection technology. That choice is simply the catalyst for the work required to improve pipeline integrity.

Done right, utilities can transform the culture, dramatically improve pipeline safety, enhance customer satisfaction, and achieve higher operational efficiency.

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