The utilities sector is at a precipice. It has now been 50 years since North American utilities made massive postwar capital investments. Many of these critical assets — electric grids, natural gas pipelines and water distribution systems — require urgent replacement to maintain safety and reliability.

By some estimates, 60% of the electric grid assets will need replacement in this decade. US natural gas pipelines are reaching the end of their natural life too. More than 60% of the pipelines were built before 1970, equating to approximately 178,000 miles of pipe that is more than 40 years old.

<table>
<thead>
<tr>
<th>Asset</th>
<th>Life expectancy</th>
<th>Average age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution transformer</td>
<td>40-50 years</td>
<td>42 years</td>
</tr>
<tr>
<td>Power plants</td>
<td>40-50 years</td>
<td>30-40 years</td>
</tr>
<tr>
<td>Transmission line</td>
<td>35-40 years</td>
<td>75% &gt; 25 years</td>
</tr>
<tr>
<td>Poles</td>
<td>30-50 years</td>
<td>50% &gt; 40 years (~60m poles)</td>
</tr>
</tbody>
</table>

The timing of these requirements could not be worse: demand and use are flat, and regulators are more strongly scrutinizing, or flat out denying, rate case increases. As well, many utilities have already spent high amounts of capital to modernize the power grid and extend the interstate gas pipeline system to accommodate the new surge in shale gas production.

Water distribution systems are even older as many in the US approach the century mark. With approximately 26% of water distribution system pipeline made of unlined cast iron and steel — and in poor condition — the US Environmental Protection Agency estimates that $138 billion will be needed over the next 20 years to maintain and replace existing drinking water systems.
What’s the issue?

Critical utility assets are reaching or have already exceeded their useful lives. Many utilities have programs in place to extend the lives of these critical assets, but time is running out. A robust reliability-centered maintenance program can delay or slow corrosion, but at some point, these assets will fail.

Today’s tougher regulatory environment aside, basic logistics means it may take anywhere from 10 to 20 years to replace these aging assets. Deferring replacement is a necessary component of any short-term strategy, but utilities also need to have a long-term capital investment strategy to protect themselves and the public from the very real risk of critical asset failure.

As assets continue to age beyond their life expectancy, the probability of a wear-out failure grows exponentially.
Why now?

The age of an asset is one cause of its ultimate failure. Other causes include:

- Historical operating practices
- Location and exposure to outside forces
- Mistakes in repairs

Utilities have generally been effective in applying reliability-centered maintenance programs to manage the process of failure. But as the assets continue to age beyond their life expectancy, the probability of a wear-out failure grows exponentially.

“There’s a perfect storm out there for the ratepayers if we are not careful.”

— Commissioner David Wright (SC), National Association of Regulatory Utility Commissioners President

How does it affect you?

According to the Department of Energy, power outages cost the US approximately $80 billion annually. In one recent high-profile case, the financial consequence of a catastrophic failure of a natural gas pipeline was large enough to threaten the financial viability of the utility.

Given the lead time needed for planning, logistics, availability of skilled resources and capital requirements, utilities are facing a decades long replacement strategy even as existing assets continue to age.
What’s the fix?

Reliability-centered maintenance programs are going to come under increasing pressure as the risk of wear-out failure grows exponentially. These programs need to be supplemented with two parallel activities: a regulatory-accelerated replacement strategy and an operational risk management framework. The first focuses on accelerating and prioritizing replacement and financial recovery while the second focuses on a more formalized avoidance program and predictive assurance of response mitigations.

Implement a regulatory-accelerated replacement strategy

Some jurisdictions have already addressed accelerated recovery of the financial costs of asset replacement through rate riders or surcharges. However, many other jurisdictions experience a longer recovery time and less certainty in rate base. Regulators themselves are conflicted. They recognize the urgency to replace certain assets but struggle with the cost that will be passed on to ratepayers. As a result, the onus is on the utility to articulate the risk profile to the regulator and create awareness of the risks and mitigation plans.

The utility must empower the regulator with a compelling case for investment that aligns with the public’s need for reliable energy distribution. A critical asset risk and investment plan allows utilities to quantify the potential financial consequences of a critical asset failure using the current risk profile and the proposed risk profile resulting from the replacement program. This type of analysis can support the creation of the compelling case regulators seek.

Understand the tax implications associated with accelerated replacement

The IRS has recently issued guidance that will impact the tax treatment of these expenditures. Because the regulatory treatment of these tax conclusions presents risks and opportunities, a utility will need to carefully analyze the regulatory dimension of these tax issues. Data analytical precision allows a utility to reflect these impacts to support its desired regulatory conclusions in a manner that gives the regulatory body confidence that the utility has complied with applicable auditing and reporting requirements. As a result, applying analytics allows a utility to realize an immediate tax benefit through “look-back” provisions and capture future benefits that satisfy regulatory and IRS demands for reporting accuracy.

Use a framework to manage the operational risk

In addition to playing the long game in terms of asset replacement, utilities need to manage in the short term the operational risk associated with aging assets. All utilities have a mitigation strategy of some kind to address operational threats. However, not all know whether their mitigation activities are working.

An effectively designed and deployed operational risk management framework helps determine whether risk mitigation activities are working, particularly before an operational threat occurs. The framework encompasses four interrelated components: periodic assessment, key indicators, loss data and modeling. It considers not only the unsafe event, but also the latent failures that may exist, such as organizational influences, unsafe supervision and other preconditions for the unsafe act.

Enable the operational risk framework with data analytics

Using advanced data analytics to enable framework activities gives utilities the ability to understand not only what has already occurred, but also why it happened and what may be lurking around the next corner. There are three levels of analytics to consider:

- **Descriptive analytics** mine past data to report, visualize and understand what has already happened (lagging indicators).
- **Predictive analytics** leverage past data to understand the underlying relationship between data inputs and outputs to understand why something happened or to predict what will happen in the future across various scenarios (leading indicators).
- **Prescriptive analytics** determine which decision and/or action will produce the most effective result against a specific set of objectives and constraints (modeling).

Deploy the framework more effectively using a Governance Risk and Compliance (GRC) platform

A GRC platform can enable a more effective deployment of the operational risk management framework. It allows utilities to use surveys or test plans to perform periodic assessments, enter risk indicators already identified by management and track the indicators by linking them into source systems already providing operational data.

Utilizing a single GRC platform to track, measure and monitor operational risks provides management and executives with a single point of view and the reporting to enable proactive decision-making when it comes to failing assets.
**Modeling**

- Perform scenario modeling for operational risk, which involves analyzing events that might occur infrequently but have the potential for huge business impact (i.e., losses)
- Use internal loss data to review smaller, more frequent losses
- Perform stress testing for exposure to tail events
- Model the evolution of tail events as they cross functions and processes

**Periodic assessment**

- Periodically refresh the risk/threat assessment
- Certify the design effectiveness of mitigation plans
- Certify operating effectiveness of mitigation plans
- Report any failures identified
- Develop and implement action plans to address failures

**Loss data**

- Systematically capture and track internal events in a consistent manner
- Perform root cause analysis for improvement actions; highlight emerging trends and identify control gaps
- Provide information to validate the periodic assessment and key indicator information
- Collect event data for the quantification of operational risk

**Key indicators**

- Identify, track and report indicators of the causes of the operational risk (leading indicator)
- Identify, track and report indicators that an operational risk has occurred (lagging indicator)
- Identify, track and report indicators that preventative mitigation activities are operating (leading indicator)
- Identify, track and report indicators that responsive mitigation activities are operating (lagging indicator)
What’s the bottom line?

Utilities, and society at large, are living on borrowed time. The economic and public impact of a single, major infrastructure failure far exceeds the positive returns that risky assets left in the ground stand to provide.

The question is: what action do we take now to minimize our exposure while we traverse the precipice?

Utilities need a multifaceted solution that considers regulatory-accelerated replacement and operational risk.

Reliability-centered maintenance programs and associated replacement programs are both necessary, but they may not be enough. To protect the public and shareholders, and to forge an acceptable outcome with regulators, utilities need a multifaceted solution that considers regulatory-accelerated replacement and operational risk.
The answers in this issue are supplied by:

Matt Chambers
Advisory Principal
Ernst & Young LLP
+1 713 750 5944
matt.chambers@ey.com

Roy Ellis
Advisory Executive
Director
Ernst & Young LLP
+1 919 981 2939
roy.ellis@ey.com

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fiveseries.team@ey.com

Let’s talk: protecting performance
Safeguarding reputation and business performance is a top priority for organizations today. Rising commodity prices are leading to greater competition for available resources and placing an ever-tightening squeeze on margins. Intense emerging market competition is forcing companies to manage internal and external access to critical information. Industry consolidation, aging assets, complex global supply chains and tighter regulatory scrutiny add to the complexity of today’s business environment. In an era bursting with opportunities and unbounded vulnerability, organizations have to rethink how they can simultaneously protect the business and accelerate performance.

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