

infraPLAN Ask the Experts! #1

Are you concerned a 1% R&R rate for your water pipes is too much?

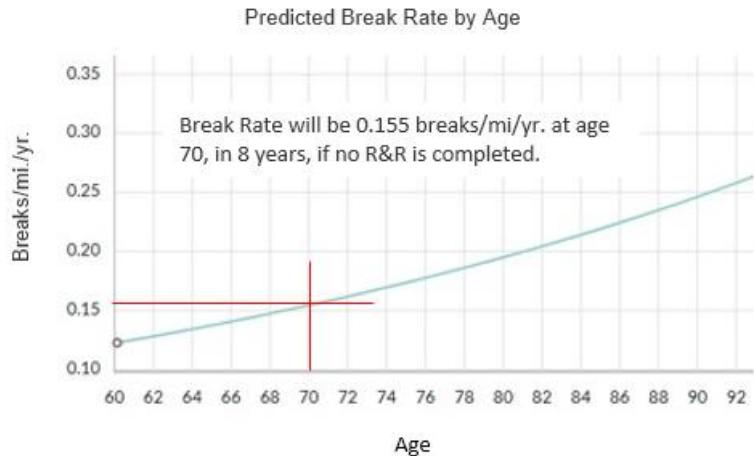


Consider an alternative approach that can save up to 80% in R&R over the next 12 years

As of 2019, a Northeastern utility had 2,855 miles of water distribution pipes that were on average 59 yrs. old with a Break Rate predicted at 0.120 breaks/mi/yr. by 2020 (if no R&R is done that year).

The objective of the utility is to maintain the Break Rate at the 2020 level of 0.120 breaks/mi/yr., or below.

Using the **PREDICT** module of infraSOFT, our proprietary Machine Learning-based Rehabilitation & Replacement (R&R) planning platform, we generated a Likelihood of Failure (LOF) score for each pipe and for **each year in the future** which we are then able to translate into a future Break Rate represented by the “do-nothing” curve in the chart below. That chart shows how the future Break Rate will increase with age absent any R&R. For example, the Break Rate would reach 0.160 breaks/mi/yr. in 8 yrs.



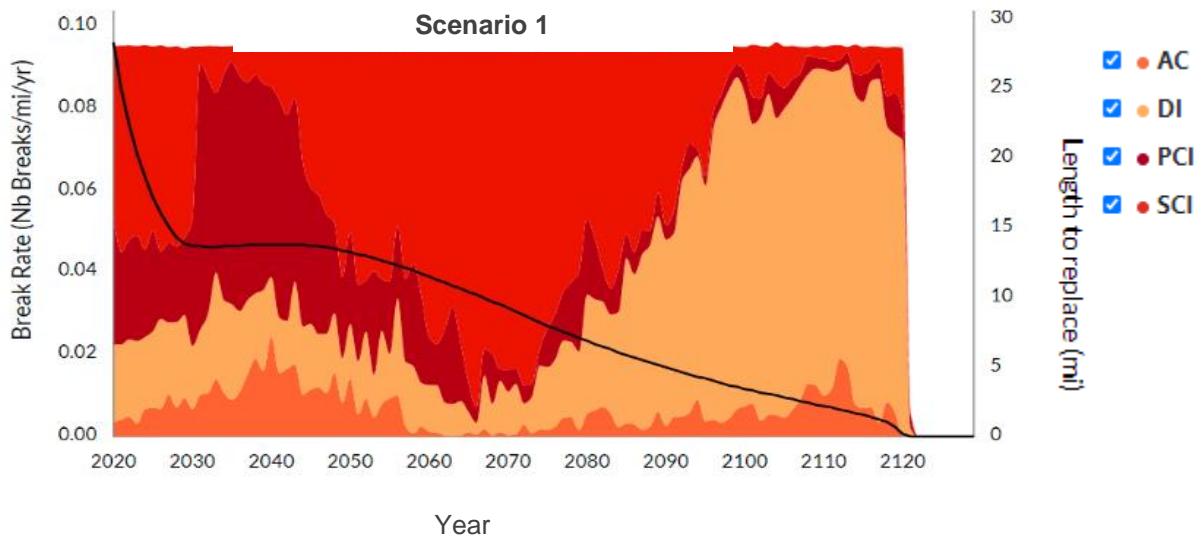
Using the PLAN module of **infraSOFT**, we then created scenarios of R&R for which specific pipes are selected based on various criteria set by the utility, including, but not limited to, their LOF.

The two charts below illustrate two such scenarios. More specifically, they show how the Break Rate (represented by the black curve on the left y-axis) is controlled at each year if a certain length of pipes is replaced (shown by the colored bars on the right y axis; each color represents a material).

The first chart below (Scenario 1) represents the 1% scenario where the utility replaces 1% of its system every year, or 28 miles of pipes as follows:

- 70% of the 28 miles are pipes that contribute the most to the Break Rate increase; those pipes have, at each year, the highest LOF as identified by infraPLAN's proprietary Machine Learning model.
- 30% are replaced for other reasons such as to coordinate with other projects, meet fire flow or hydraulic capacity requirements.

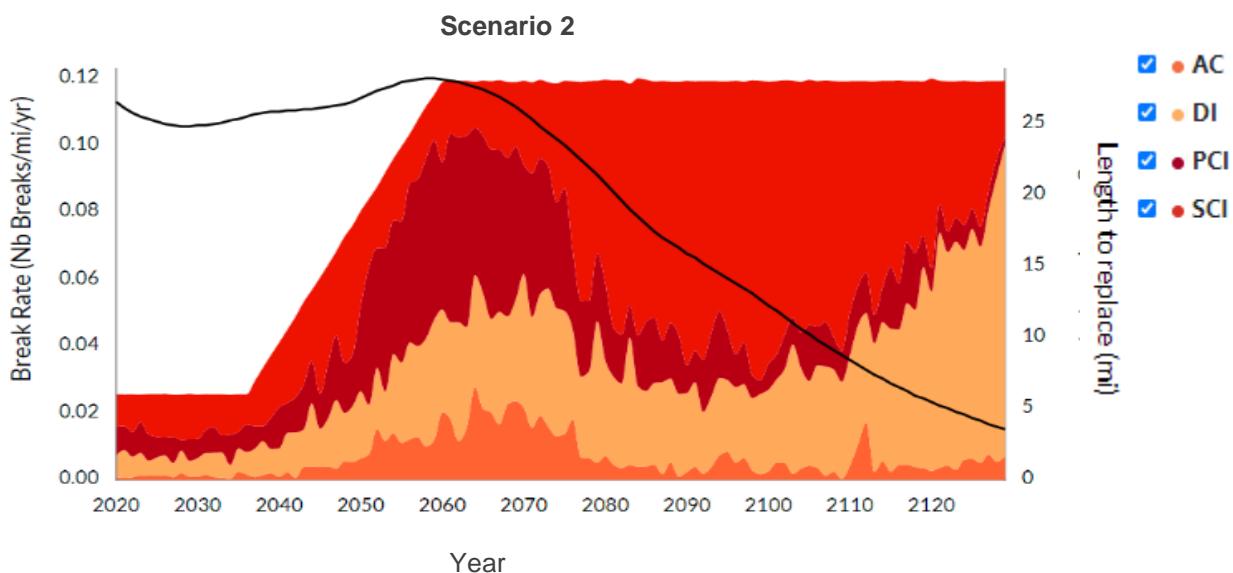
The chart shows that, following that 1% scenario, the resulting Break Rate (left y-axis) would decrease steeply from 0.100 breaks/mi/yr. in 2020 (after 28 mi of R&R that year), to 0.050 breaks/mi/yr. at age 70 (10 years later), a Break Rate that is lower than what the utility wants to achieve (0.120 breaks/mi/yr.), **which would incur a R&R expense of approximately \$84 million per year.**



This unnecessarily sharp reduction of the Break Rate experienced in Scenario 1 points to the fact that the utility may be able to reduce its R&R expenses while still meeting its Break Rate objective, an option we explore in Scenario 2.

Scenario 2 is illustrated in the chart below. The utility achieves its goal (stay below 0.120 breaks/mi/yr.) this time with only 6 mi of R&R per year (instead of 28 mi in Scenario 1) for the first 15 years, at a cost of \$18 million per year; a saving of \$66 million compared to Scenario 1. (or close to 80% of the original price tag of \$84 million). Then, to remain under 0.120 breaks/mi/yr., the utility has to ramp up R&R from 6 mi in 2020-2035 to 28 mi/yr. in 2060.

The total saving over 40 years is \$1.8 billion.



How did we complete this project?

- **infraSOFT CLEAN module.** The Machine Learning-powered cleaning algorithm of CLEAN was used to clean the data. Data quality is key to reliable results.
 - **infraSOFT PREDICT module.** The Machine Learning break prediction model of PREDICT was used to generate a LOF score, and predict the future break number, for each pipe and at each year.
 - **infraSOFT STATS module** was used to detect data issues and interpret results.
 - **infraSOFT PLAN module** was used to quickly simulate numerous R&R scenarios and settle on a plan that meets utility's constraints and objectives.
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Discover

infraPLAN has pioneered the use of advanced analytics in the field of water pipes R&R planning. The combination of our industry leading platform, infraSOFT, and extensive consulting experience enables utilities and their consultants to generate data-driven R&R forecasting answers they understand and trust.

<https://www.infraplan-llc.com>



Annie Vanrenterghem Raven,
PhD, CEO

Discover

Our platform, infraSOFT, stems from two decades of field and research study; infraSOFT puts the power of Machine Learning at your fingertips to help you optimize water pipes R&R plans.

<https://www.infraplan-llc.com/infrasoft>



Discover our “Ask The Experts” series of articles

Where we address the technical questions we are regularly asked about applying advanced analytics to water pipes R&R planning.

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