Key Performance Benchmarks for Central Event Management

TaKaDu Central Event Management (CEM) has been in operation at utilities across the world for several years. The constant monitoring over time of a wide range of networks generates extensive data-based insight and experience that can be leveraged to benchmark utilities' performance. As part of its ongoing work with utilities, TaKaDu regularly reviews performance data generated by its customers to provide insight into varied aspects of network management and identify areas for potential improvements.

In this article, we introduce some of the key performance indicators (KPIs) by which utilities can measure their own event management performance and compare themselves to industry benchmarks. We normalized the KPIs in this study to eliminate factors such as size or location of utilities. All performance data shared in this article are drawn from the same 15 utilities, providing an aggregate picture of how scores in one KPI can relate to performance in other areas.

1

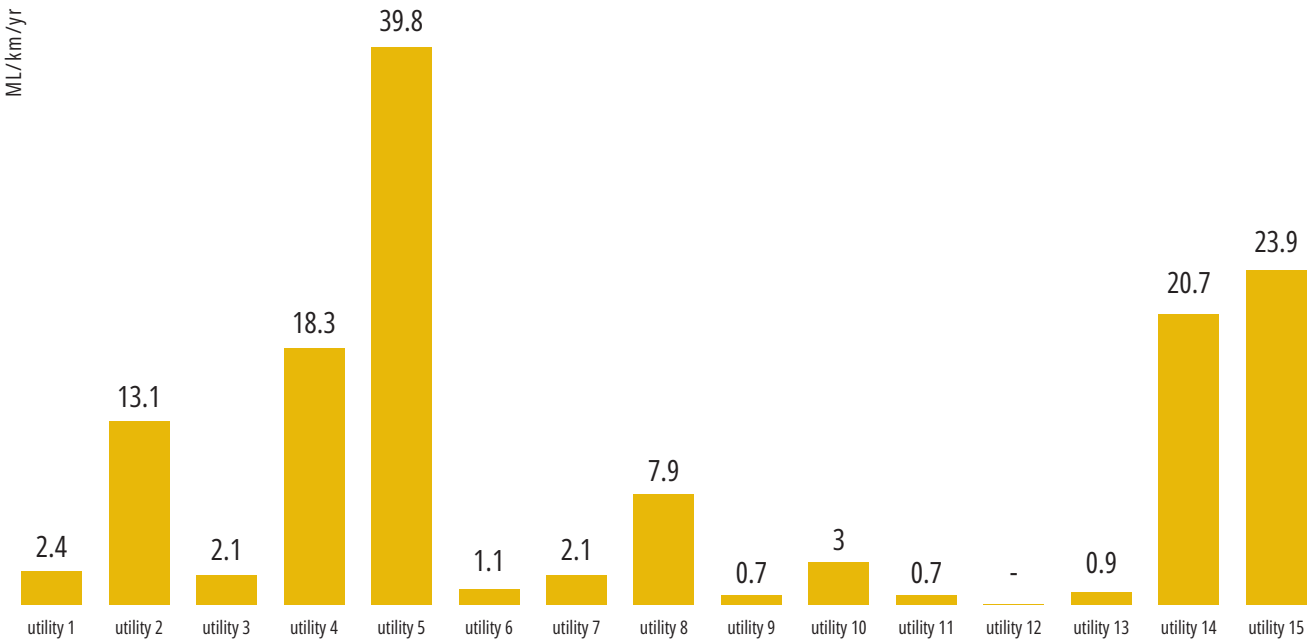
Benchmark insight:

CEM leaders typically achieve water savings of over 7 ML/km/yr.

Water Savings

The annual Water Savings KPI aggregates savings from all leak events CEM detected automatically and confirmed by the utilities. We calculated the amount of water that would have been lost if those leaks had continued for the length of time that, without CEM, such leaks typically go undetected. It is widely recognized across the industry that hidden leaks usually continue running undetected for about one year.

In the graph, we see that many of the utilities are saving less than 3 ML/km/yr, while others are saving from 20 ML/km/yr up to almost 40 ML/km/yr. When these results are viewed in the context of other KPIs (noted below), we understand that the utilities with the lowest water savings typically also have low scores in other areas, such as data quality or availability, or their response time to leaks, telemetry failures or faulty meters. The reverse also applies; higher water savings typically correlates to higher scores in the other KPIs. Disregarding outliers, we have concluded that utilities that are using their TaKaDu CEM solution effectively, typically achieve water savings of over 7 ML/km/yr.



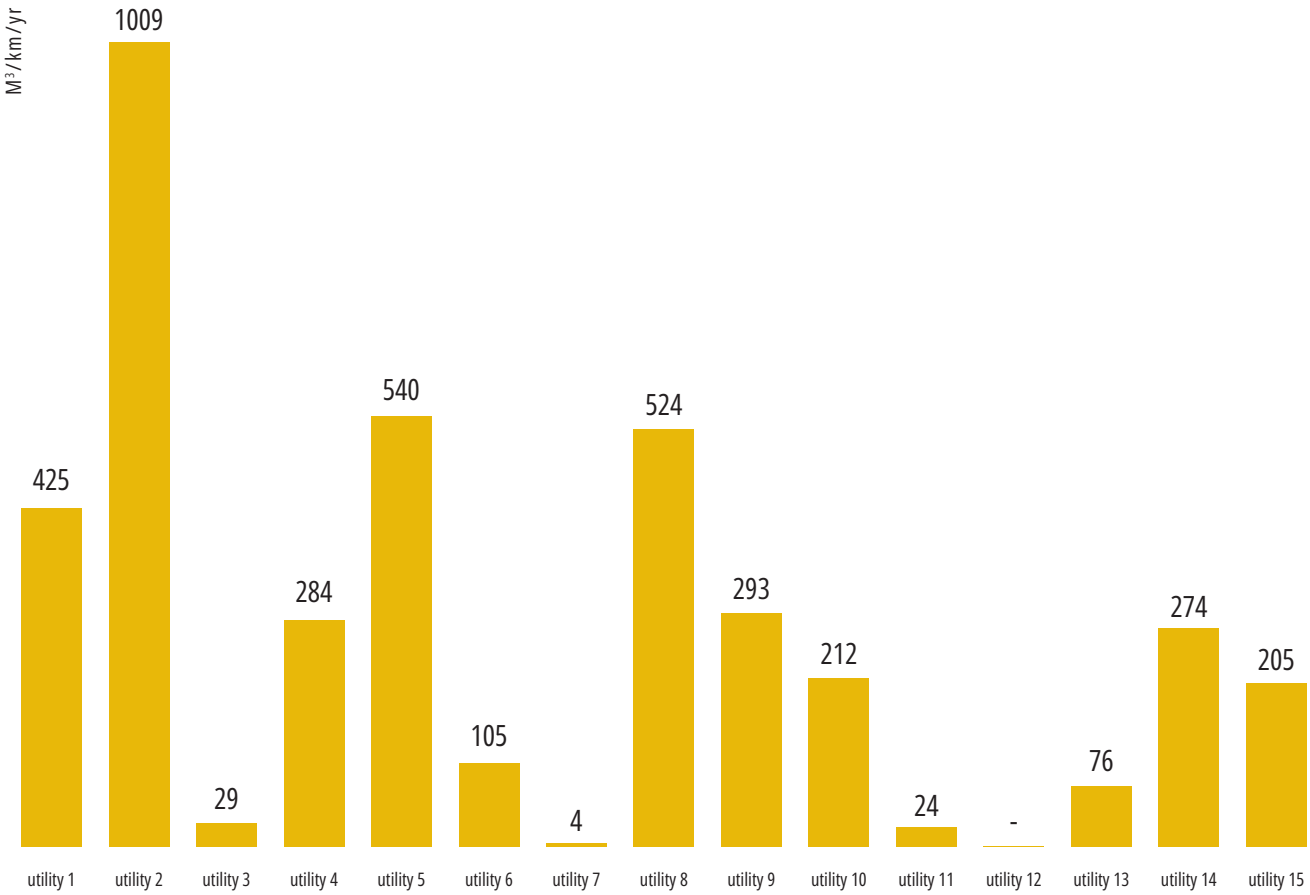
2

Benchmark insight:

Water loss of less than 200 m^3/km/yr typically indicates a problem with data.

Water Loss

The Water Loss KPI is, by its nature, closely related to the Water Savings KPI. It measures the water loss from all the events that CEM detects and are confirmed as leaks by users. The values are in cubic meters over a period of one year per kilometer of water network (normalizing the values). Based on this KPI, leading utilities experience over 200 m^3/km/yr of water loss. Lower values are usually an indication of one or more of the following challenges: missing data, inadequate data quality, or a low usability rate.



3

Benchmark insight:

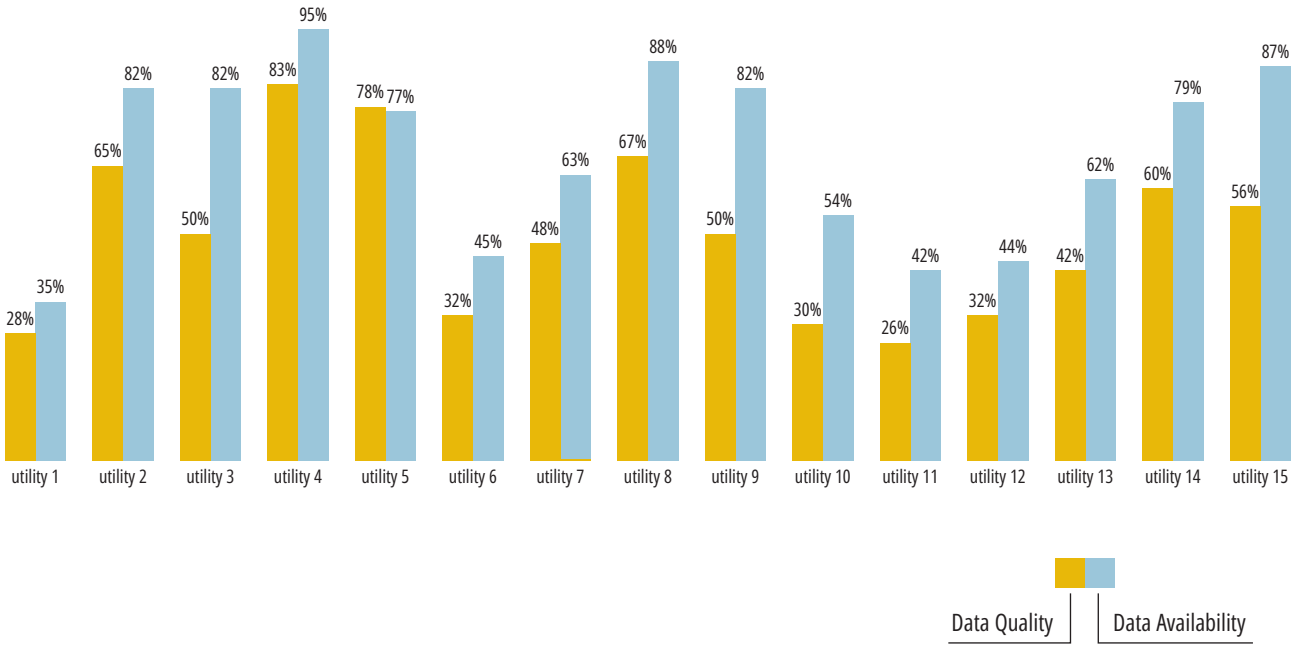
Utilities should be aiming for a score of at least 60% for Data Quality and 70% for Data Availability.

Data Quality and Availability Scores

Data Availability and Data Quality are two of the strongest indicators about the ability of utilities to monitor asset failures. In areas of the network where the data arrives infrequently and with inadequate quality, utilities have limited capabilities to monitor these areas and detect asset failures such as leaks.

The Data Availability score is arrived at by combining transmission latency and missing sample performance.

- Transmission latency is the delay between the most recent sample time to the current time while taking into account sensor transmission frequency. Shorter latency will contribute to a better Data Availability score.
- Missing sample performance is the fraction of expected samples (according to the sample rate) that are missing or invalid. A lower fraction will contribute to a better Data Availability score. For example, if four samples per hour are expected but only one sample is sent, that would reduce the Data Availability score.



3

Several factors impact Data Quality, and one that has a relatively strong impact is Periodicity. We therefore decided to use Periodicity as the indicator for Data Quality. Periodicity measures how well the water supply repeats itself over time. For example, if Monday this week is identical to the Mondays in the last two weeks. The same is applicable for the behavior of the supply within the day. If the supply shows a consistent pattern over time, the Periodicity score will be high, hence the Data Quality will also be high. The higher the Data Quality is, the higher the capability of CEM to detect leaks with high confidence.

A high Data Quality score is possible only when the Data Availability Score is also high. According to our experience, utilities monitor their network very well when their Data Quality and Availability scores are at least 60% and 70% respectively. Any lower means there are blind spots in the network – places where there is limited visibility and limited ability to identify leaks early in their evolution.

In the previous graph, we can see that Utility 15 has very good Data Availability but falls slightly short of the ideal on Data Quality.

4

Benchmark insight:

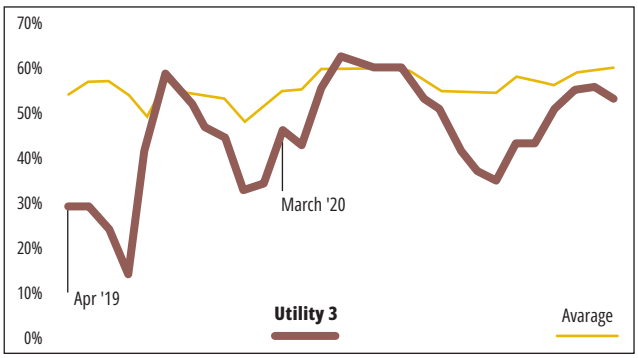
Most utilities improve their data quality in the first year of using TaKaDu. Leading utilities continue improving over the years.

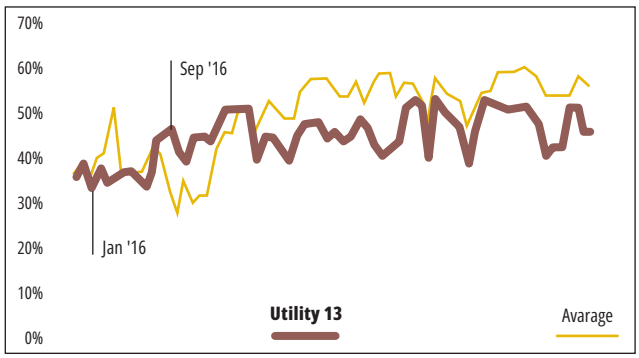
Data Quality Trend

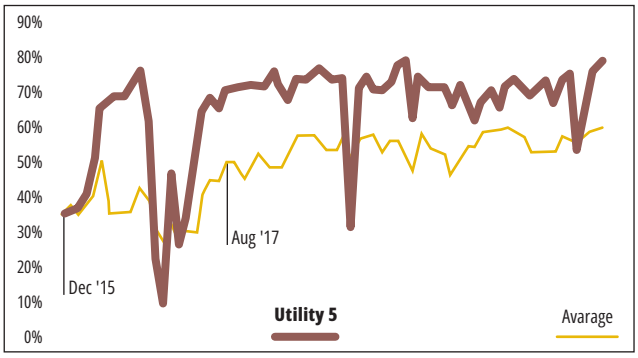
When a utility first implements TaKaDu CEM, its Data Quality score might not be as good as it should be. However, over time, leveraging the insights provided by TaKaDu's KPI analysis, many utilities are able to improve their score.

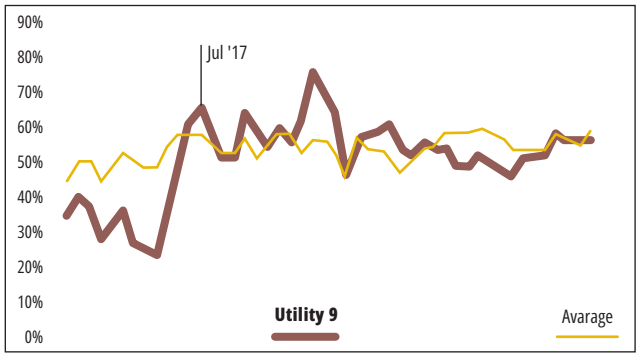
Each of the graphs compares a utility's Data Quality Score with the average score for all TaKaDu customers. In most cases, utilities significantly improve their Data Quality score in the first year of adopting the TaKaDu solution, fixing issues that are brought to light by the system. They then continue to improve slowly and relatively steadily over time (for example, Utilities 5 and 9).

Utility 3's Data Quality score is more volatile, suggesting Utility 3 is not maintaining the network monitoring assets in a consistent manner. That said, having started out with significantly below-average performance, it has closed the gap, and, if it continues to fix issues, it should continue to improve.









5

Benchmark insight:

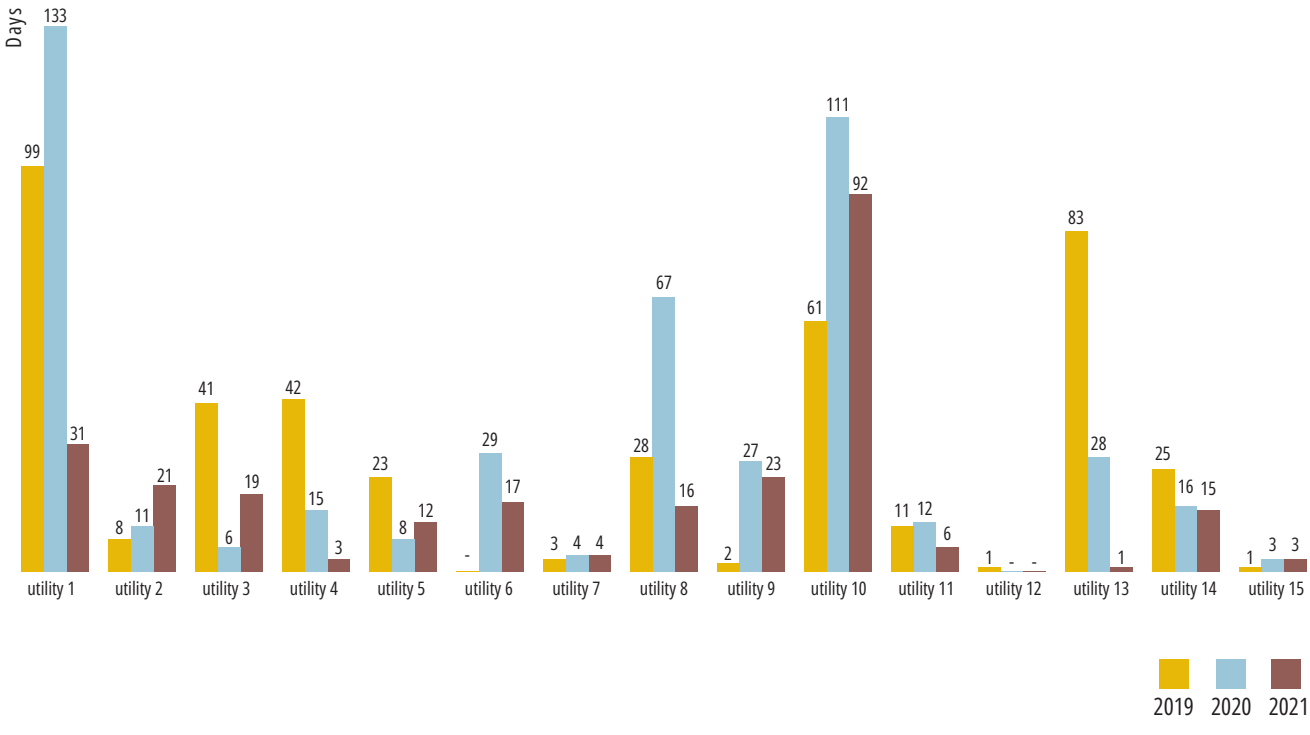
Utilities should aim for a Response Time to General Leaks of less than 1 week.

Response Time – General Leaks

The Response Time – General Leaks graph shows the average time lag between when TaKaDu CEM issues an alert that it detected a leak and when the event is marked in the system as fixed and closed. A faster response time equates to reduced water loss.

Most of the utilities reduced response time significantly over the course of the past three years. This reflects their adoption of methodologies and processes enabled by TaKaDu, leading to improvements in inter-departmental communication (less working in silos), increased visibility into their network, and the ability to make decisions faster.

Utility 15 went through the transformation of adopting new methodologies and processes more than three years ago. Since then, it has consistently been able to respond very quickly to general leaks. Even during the pandemic, it managed to maintain a very fast response time.



6

Benchmark insight:

Utilities should aim for a Response Time to Hidden Leaks of 2-6 weeks.

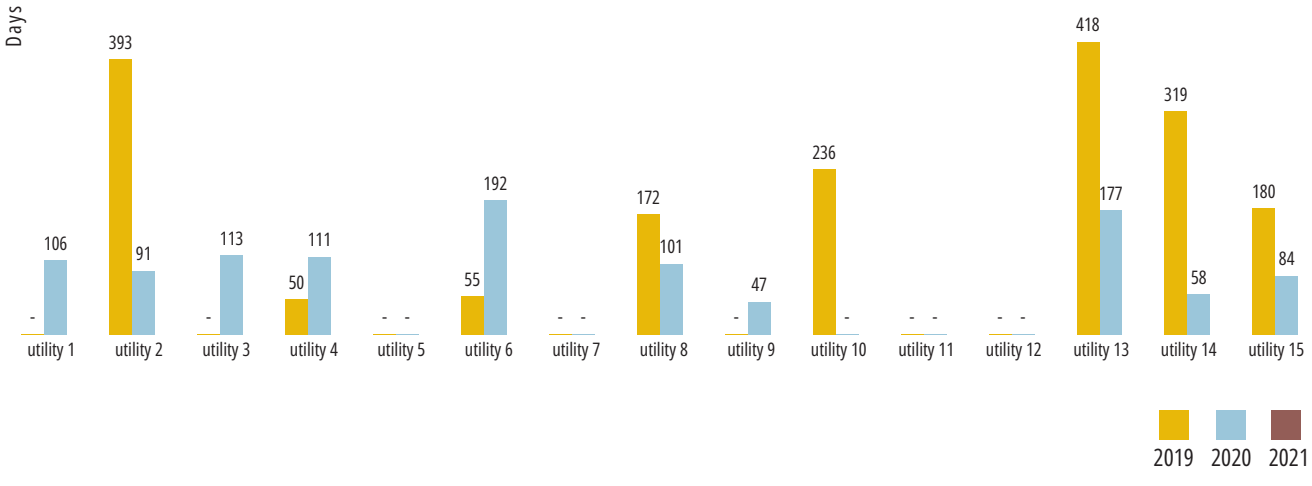
Response Time – Hidden Leaks

Because hidden leaks tend to be smaller than general leaks, many utilities pay less attention to them, placing them at lower priority for fixing. As a result, response time is typically slower. Additionally, identifying the location and source of the leak can be very time-consuming, and the entire process from investigation to final fix can involve multiple departments. We see that a response time of 15 weeks (105 days) or more in the first year of using TaKaDu is not unusual. Some utilities took six months or a year, or even more. Depending on the volume of hidden leaks, those long response times can result in huge water loss.

In almost all cases, the utilities saw dramatic year-to-year reductions in their response time to hidden leaks. Today, from the time TaKaDu CEM alerts them that a hidden leak exists, it takes leading utilities 2-6 weeks to fix it. As with general leaks, improvements in working procedures, increasing the prioritization of these events, and reduced working in silos following adoption of TaKaDu enable most utilities to reduce the time from identification to repair.

To illustrate the value in reduction of water loss as a result of reducing the response time to hidden leaks, consider a hidden leak with a magnitude of 1 liter per second. Shortening the response time by 10 days results in 864,000 liters less water loss, and shortening the response time by 100 days results in 8,640,000 liters less water loss. As you can see in the graph, some of the utilities shortened their response time over the years by even more than 100 days.

Note that Utility 15 succeeded in reducing its response time to hidden leaks by almost 75%.



7

Benchmark insight:

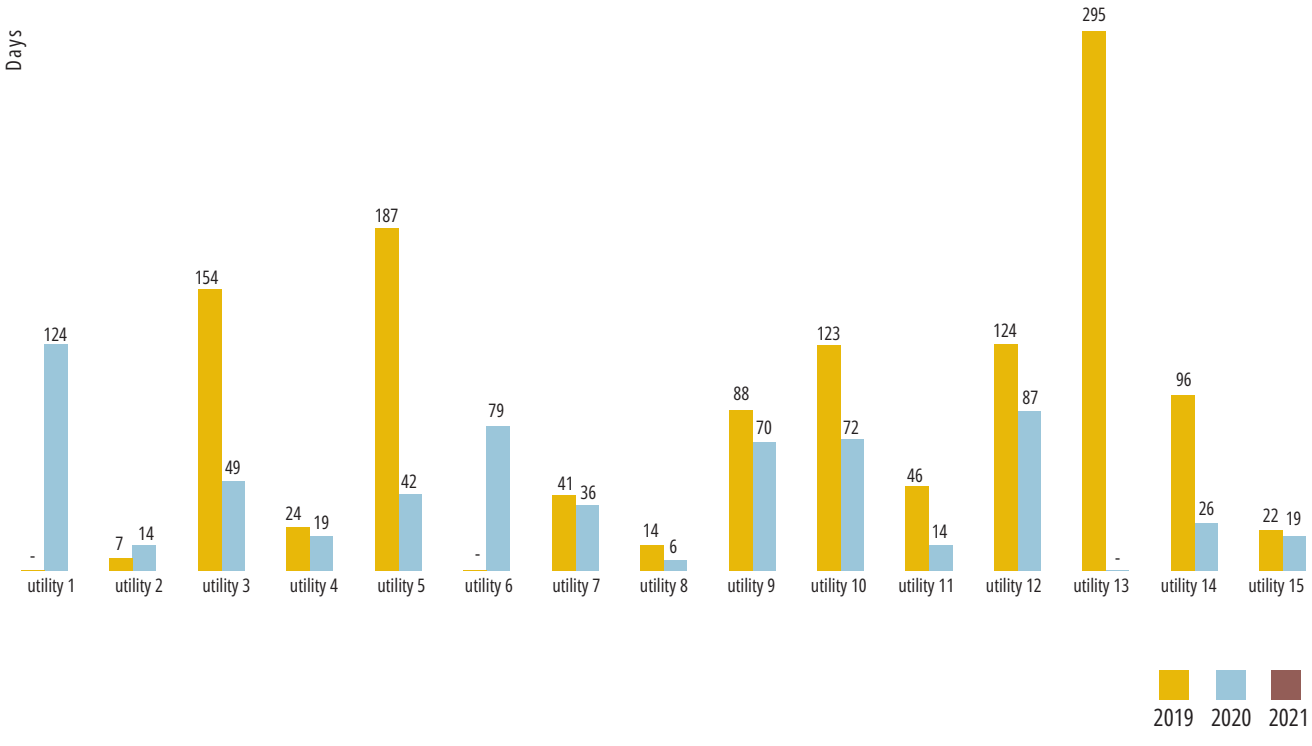
Utilities should aim for a Response Time to Telemetry Faults and Faulty Meters of about 1 week.

Response Time – Telemetry Faults and Faulty Meters

Every utility must contend with disruptions to telemetry and faulty meters. The speed at which such issues are identified and fixed is important because it impacts the quality and availability of data, which in turn determines how long it takes to detect both hidden leaks and general leaks.

Most of the utilities reduced their response time significantly. Those that started with a long response time shortened it by around 60% or even more within three years. This can be attributed in large part to the improvements in working procedures and reduced working in silos that follow adoption of TaKaDu.

The utilities that started with a relatively short response time to telemetry and meter faults have seen less relative improvement, reflecting their initial good performance. Their response time after three years of working with TaKaDu CEM is typically around 1 - 2 weeks. Utility 15's response time has remained almost unchanged, indicating this is an area in which it should aim to improve.



8

Benchmark insight:

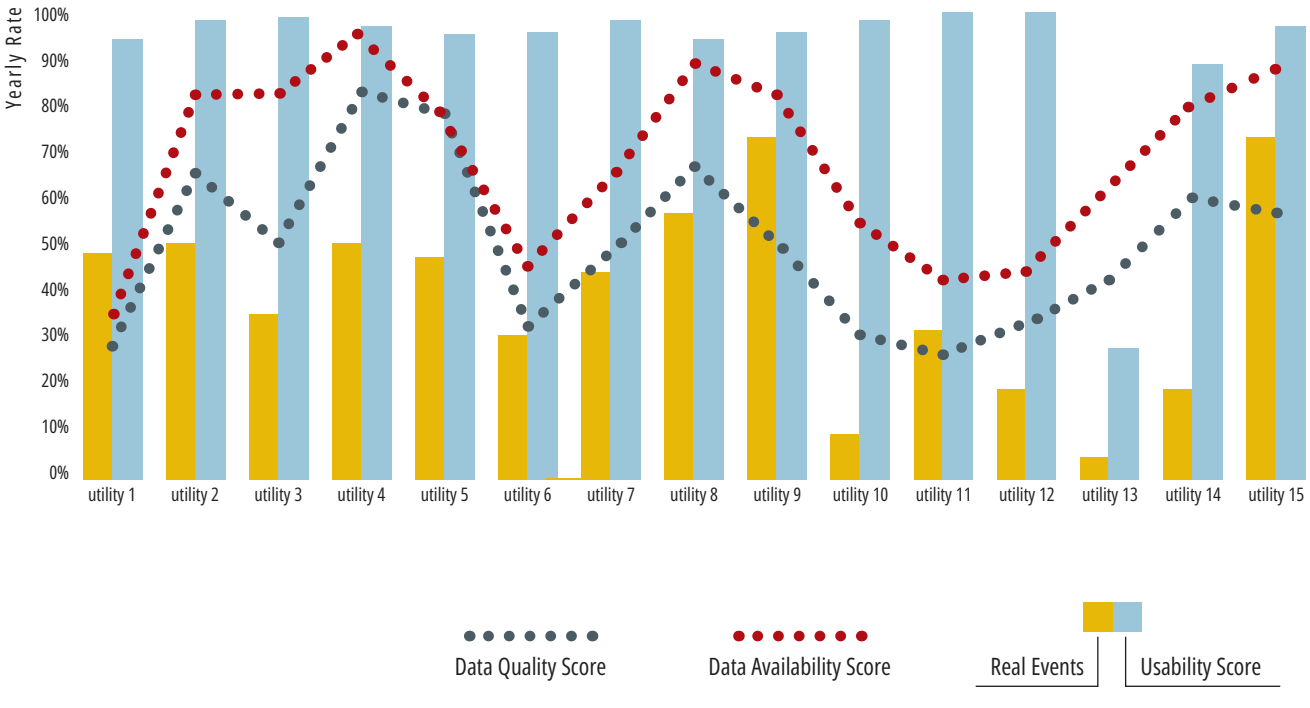
Leading utilities experience a Real Events Detection rate of 73% to 81%.

Real Events Detection – Annual Rate

The Real Events Detection Rate KPI shows the percentage of TaKaDu event alerts that require the utility's attention rather than false-positive events, which may be caused by higher consumption. We can see that the percentage of Real Events Detection correlates more or less with the scores for Data Availability, Data Quality and Usability*.

A high Real Events Detection Rate impacts the Usability Score and vice versa. This is because when the data is reliable, users trust the system more, which in turn encourages them to use the system more and better. Similarly, the way users interact with the system affects the ability of the system to detect anomalies and distinguish between consumption and leaks. Based on that feedback, the system learns and improves the Real Events Detection rate.

Most important to note, high data availability and at least average data quality are essential for a high Real Events Detection Rate. In most cases, there appears to be a strong correlation between high usability, high data availability, good data quality, and the ability to detect high rate of quality events. Leading utilities experience a rate of 73-81% of quality events.



* Usability is the score given to indicate the amount of interaction the users have with TaKaDu CEM. The calculation is the number of events the user manages out of all the events issued by the system that the user did not interact with. The higher the number of events the user interacts with compared to the total amount, the higher the score is.

Utility 15, which has a high Data Availability Score (87%), a slightly-better-than-average Data Quality Score (56%) and a high Usability Score of 98%, also has a very good Real Events Detection Rate (73%). The benefit of these high scores is borne out by Utility 15's high water savings of 23.9 ML/km/yr – more than three times the industry leader threshold (as noted in Section 1 of this article).

Conclusion

TaKaDu's visibility into utilities' performance across multiple metrics enables aggregation of vast amounts of data, providing the basis for industry benchmarks in performance and improvement trends. As deployments of the TaKaDu Central Event Management (CEM) solution continue to increase and evermore longitudinal data is available from veteran users, TaKaDu is continually refining its CEM performance benchmarks. Users of TaKaDu have exclusive access to the insights in order to measure their own CEM performance and identify areas for improvement.

For more information about Central Event Management benchmarks and anything related to CEM, please contact TaKaDu.