

*A Mariner White Paper*

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# Revenue Protection using Machine Learning for Utilities Management

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## Abstract

Visibility is key in any business. Visibility into your processes, customers, billing, etc. are all important in evaluating your performance. However, when the lens you are looking through is cloudy, how can you expect what you are seeing to be the truth? In the utilities sector, the metaphorical lens is a utility meter. Gas, water, electricity all use meters to evaluate a customer's usage and then to bill them accordingly. What happens when the meter fails to perform as expected? What happens if you do not catch it? This can impact your revenue stream greatly. If your meter is underperforming (reporting less usage than actual), you are missing out on the money the customer really owes you. If your meter is overperforming (reporting more usages than actual), your customers will nonetheless be unhappy with the inflated bills, but you now have a liability to make it right.

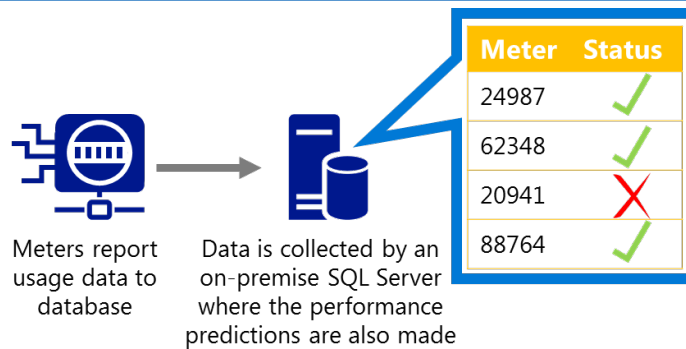
## The Meter Problem

Customer bills need to be accurate. Inaccurate bills not only cause confidence and financial issues with customers but also cause loss of revenue for the company. Meters can slowly degrade over time, showing usage which is lower than the true usage. These meters may eventually show a zero usage, even though the customer continues to have service and use the utility. Eventually a crew will be dispatched and the meter will be replaced or repaired. The customer will then have to pay for the prior un-billed usage.

It would be a much better scenario to recognize failing meters quickly, so that this use-case would never occur. Plus, dispatching a repair crew to a customer location is not a cheap endeavor either. By having better knowledge about the behavior of your meters, you can save on unnecessary expenses as well as secure the appropriate and expected revenue stream.

Both new and old meters are susceptible to failure. So, it is impractical to only look at older meters as the ones causing the revenue loss from low or inaccurate reporting. Because of this, we need to take an intelligent approach that looks at a meter's usage over time to see if things are awry. In a manual sense, an analyst could sit at a table for hours on end looking at graphs of utility usage over the past few months and visually see where there are problems. However, with thousands of meters and clients, this becomes unfeasible for a single human to consume on their own. Enter the modern way: letting the computer handle the job.

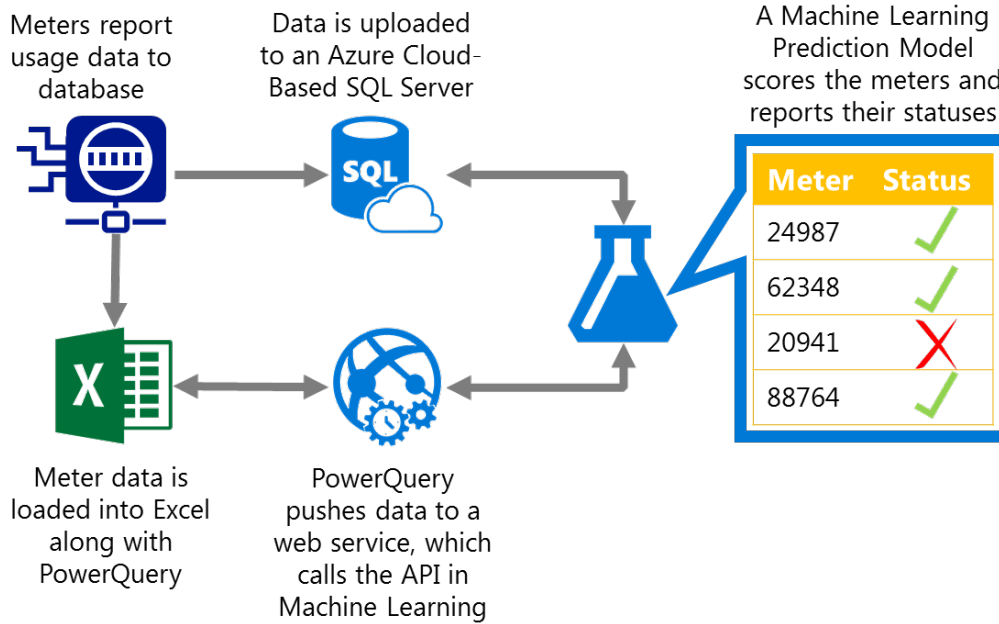
## A Classic Approach



A classic approach to this problem is to use Microsoft's SQL Server Analysis Services.

## A Machine Learning Services Approach

Taking advantage of Microsoft’s machine learning platform will allow for faster, cloud-based processing. Rather than calculations and classification being completed in SQL Server Analysis Services or alternatively as a standalone calculation effort, we can harness the power of the cloud to do the work for us. Heavy amounts of calculations in SQL Server environment can be sluggish and calculating by using a standalone solution (R or Excel calculations, for example) are much faster, but can only take in a set batch of data at a time. The calculations must be manually run every time new data comes in. Therefore, Azure ML will alleviate both of these issues (speed and automation).



Once the solution is built within Azure Machine Learning, the solution is published as a web service. An API is generated and called by the user (via SQL Server Integration Services or Excel Power Query, etc.). This package allows the user to send information into the ML service and receive the result based on the calculations defined in the ML service.

## Performance Comparison

To test the two previous approaches, we use a sample dataset consisting of usage, location, and weather data for a large set of meters.

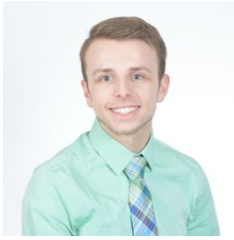
<b>Meters</b>	10,000
<b>Zip Codes</b>	2,000
<b>Date Range</b>	~2.5 years
<b>Amount of Data</b>	960,000 rows

Upon reaching the ML system, the prediction calculations took 7 minutes to compute on this sample dataset.

## Conclusion

Whether you let an on-premise solution like the classic approach handle the prediction or you decide to harness the power of the cloud using Microsoft Azure, protecting your revenue has never been easier to set up. Prediction of customer utility usage can provide true insight into how your equipment is performing. By gaining visibility into this, your revenue will be secured as you will be able to bill more accurately. Plus, your company image will be positively affected as your customers will be more accurately charged for your services as opposed to having unexpectedly low bills and then the shock of large bills to make up for the meter error. Imagine being able to better dispatch your repair personnel to only the sites where meters are accurately predicted to be failing rather than basing it on a whim. Predictive analytics gives vision into your company's processes and, as you can see, there can be a big impact. Protecting your revenue through better analysis of meter data is a great place to start.

## About the Authors



### **Colby Ford, M.Sc., Data Scientist**

Colby is a Data Scientist at Mariner. Using a background in mathematics and statistics, he puts the Azure Machine Learning system to work along with R to gain insight from data. Outside of work, Colby is a pianist, Netflix junkie, bioinformatics researcher and Ph.D. student at the University of North Carolina at Charlotte.

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### **Wayne Snyder, Distinguished Data Analytics Architect**

An expert in all things data, Wayne is an impeccable source of knowledge in the data analytics world. He is a Microsoft SSAS Maestro, expert SQL architect, and business intelligence professional. When he's not writing SQL, Wayne enjoys spending his time playing music.

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