AT&T 10x Case Study:

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AT&T believes technology plays a critical role in reducing carbon emissions. So, we're using the power of our network to create a better, more environmentally sustainable world. We've set a goal to enable carbon savings 10x the footprint of our operations by the end of 2025.

To meet, we're working to make our operations more efficient across the company. We're also working with our customers and technology collaborators to implement and scale carbon-saving solutions. This case study discusses and quantifies the carbon benefits of using AT&T technology to boost efficiency. This is one study in a series we're sharing as we progress toward our 10x goal.

Learn about our goals, our progress, and see more case studies like this at att.com/10x.

Summary

There are more than 2.6 million miles of oil and gas pipelines criss-crossing the United States.[1] Even as energy companies strive to transition to less emission-intensive energy sources, it is critical that they monitor and maintain these pipes to limit leaks and address safety concerns. To that end, Federal regulations require inspections every two months to help identify and address damage to this critical infrastructure. OmniMetrix, a provider of critical asset management services, uses AT&T Internet of Things (IoT) to enable customers to monitor the condition of their steel pipelines. OmniMetrix customers use this technology to help reduce the time, fuel and costs associated with traveling to inspections. By extension, this efficiency helps reduce the greenhouse gas (GHG) emissions associated with these inspections. In addition, this remote monitoring system enables more detailed and timely information about the health of pipelines, creating the potential for reduced leakages. OmniMetrix provides this service to a range of pipeline companies, connecting thousands of sensors at the end of 2018, reducing inspection travel time by an estimated **8,500 hours**, saving approximately **$300,000**[2] **in fuel and labor costs**, and shrinking gasoline usage by around **22,000 gallons** of gas a year[3], equivalent to almost 200 metric tons of CO_2e.[4]

Annual estimated benefits of OmniMetrix pipeline monitoring

Over $300,000 in reduced fuel and labor costs

Over 22,000 gallons of gasoline

Over 8,500 hours of reduced drive time

Almost 200 metric tons of CO_2e avoided[3]

1. "General Pipeline FAQs," Pipeline and Hazardous Materials Safety Administration, February 26, 2019, https://www.phmsa.dot.gov/faqs/general-pipeline-faqs
2. Average hourly wage based on "Average hourly and weekly earnings of all employees on private nonfarm payrolls by industry sector, seasonally adjusted," Bureau of Labor Statistics, September 06, 2019, https://www.bls.gov/news.release/empsit.t19.htm and average cost of fuel based on "USA Gasoline prices, 23-Sep-2019," GlobalPetrolPrices.com, September 23, 2019, https://www.globalpetrolprices.com/USA/gasoline_prices/
3. Calculations are based on actual savings from 122 sites that were extrapolated across all pipeline monitoring connections provided by OmniMetrix.
4. "Greenhouse Gas Equivalency Calculator," U.S. Environmental Protection Agency, August 16, 2019, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator (Nwote, the average eGRID electricity factors have been used rather than the marginal AVERT electricity factors, this being a more conservative estimate of the savings).

Background

Pipelines can provide an efficient way to transport significant volumes of liquid or gas across the country. However, when steel pipelines are in the ground, they will inevitably corrode, which is one of the leading causes of pipeline failure in the oil and gas industry. According to a study conducted by the National Association of Corrosion Engineers (NACE), pipeline corrosion can cost anywhere between **$5.4 billion and $8.6 billion** in the U.S. alone.[5] To help prevent corrosion and keep the soil away, pipeline operators apply a coating to the exterior of the pipe to keep the dirt away from the pipe, but even this coating can deteriorate over time.

$5.4 - $8.6 billion

Estimated costs due to pipeline corrosion[5]

To further prevent the pipeline from deteriorating, pipeline companies use cathodic protection to provide an electrical protection against corrosion. Rectifiers are placed on the pipeline every 5-10 miles, generating an electric current that can help protect the pipeline when there are defects in the coating. If these rectifiers fail to operate properly, the current stops and the possibility of corrosion increases. To address this issue, pipeline companies install various remote monitoring devices to monitor the effectiveness of the cathodic protection.

5. Krystal Nanan, "Pitting Corrosion in Oil and Gas Wells and Pipelines," Corrisionpedia, June 25, 2018, https://www.corrosionpedia.com/pitting-corrosion-in-oil-and-gas-wells-and-pipelines/2/6778

The Challenge: Pipeline inspections are critical but traditionally time, cost, and fuel intensive

PHMSA requires frequent pipeline inspections

- Inspections every 2 months
- Detailed inspections every year

The Pipeline and Hazardous Materials Safety Administration (PHMSA) requires pipeline operators to inspect pipelines every two months.[6] Traditionally, this has meant that pipeline inspectors must drive to distant inspection points. Since these inspections points are typically 5-10 miles apart on the pipeline, and the pipeline does not necessarily follow the roads, the actual driving distance from rectifier to rectifier can be much longer. Because most inspectors are driving trucks to the sites, this means they can use lots of fuel to do just a few inspections a day. This is costly, time-intensive, and has an environmental impact in terms of fuel usage and the associated GHG emissions.

The Solution: OmniMetrix collaborates with AT&T IoT to collect remote inspection data

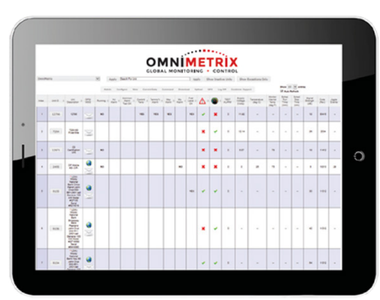
With a history of using wireless technolology to monitor equipment that dates back to 1998, OmniMetrix provides greater visibility and control of cricital assets for their customers. By working with AT&T IoT, OmniMetrix enables pipeline companies to reduce inspection-related time, costs and emissions by remotely monitoring cathodic protection rectifiers.

OMNIMETRIX
GLOBAL MONITORING • CONTROL

"Use data, not trucks."

OmniMetrix slogan

OmniMetrix adds a wireless sensor to the rectifiers on the pipeline and sends current, voltage and other data via AT&T IoT connectivity to the cloud. AT&T's network provides highly secure and dependable transmission of this data, an essential requirement since this data is used for compliance reporting. Customers can access this data, receive alarms, and monitor current and voltage to ensure that the cathodic protection equipment is operating correctly. OmniMetrix's StormSense™ feature works in conjunction with data from the National Weather Service to either disconnect itself from the AC voltage on the rectifier or suspend the gathering of data to protect itself in case of bad weather.

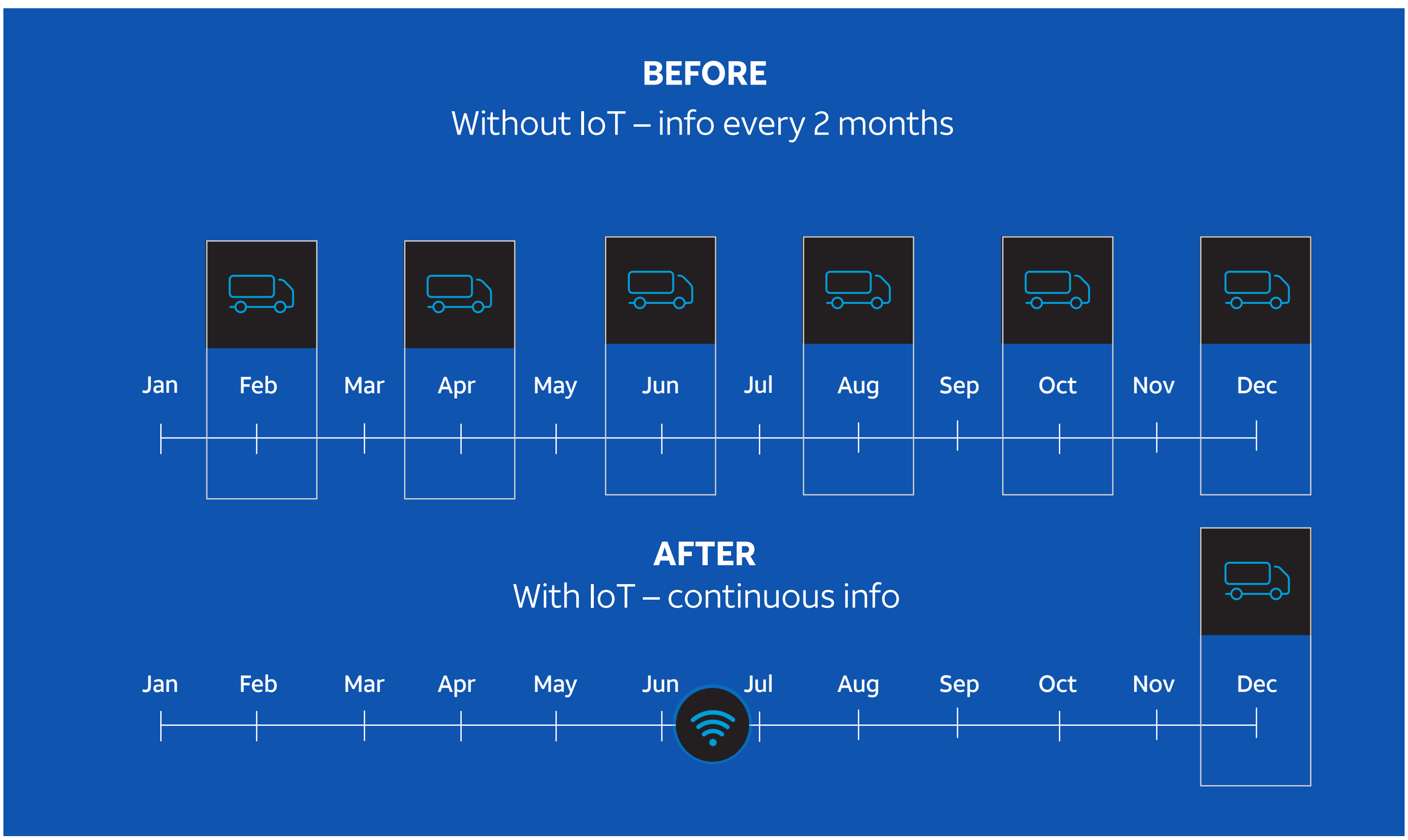


6. "PHMSA Regulations," Pipeline and Hazardous Materials Safety Administration, September 8, 2017, https://www.phmsa.dot.gov/phmsa-regulations

> **"Our customers are motivated to reduce their costs and their environmental impact. Using AT&T IoT to power the OmniMetrix monitoring solution gives them the insights they need to tune their operations and drive efficiency, helping their bottom line and the environment."**
>
> **- Walter Czarnecki, President & CEO, OmniMetrix**

Previously, inspectors would travel long distances at least every two months to all rectifier sites along the pipeline to comply with PHMSA requirements. Now pipeline operators only need to dispatch an inspector to drive to the rectifiers once per year to visually inspect the equipment for physical damage from the weather or animals. This helps the pipeline operator maintain compliance and reduce costs, fuel usage and associated GHG emissions.

Wireless sensors added to the rectifiers on the pipeline send current, voltage and other data via AT&T IoT connectivity to the cloud.



Sustainability Impact: Remote monitoring of long-distance pipelines can help dramatically reduce travel-related costs, time, and emissions

The compelling business case for this solution suggests that this type of remote monitoring and inspection could become the norm across the pipeline industry. In addition, this type of monitoring could also be used on storage tanks and filling stations, further reducing the needed inspection drive time and resulting emissions.

Wider adoption of this type of asset monitoring can help reduce emissions substantially. If pipeline operators used remote monitoring for just 10% of the 2.6 million miles of pipeline for their inspections and experienced benefits like the current OmniMetrix customers, they could lower fuel and labor costs by an estimated **$4 million** and reduce GHG emissions reductions by **2,500**[7] **metric tons of CO_2e** annually. This is equivalent to:

Taking almost 550 cars off the road

or

Not burning almost 287,000 gallons of gasoline

or

Switching almost 85,000 incandescent bulbs to LEDs[8]

7. 2,600,000 / 10 miles between sensors * 10% * 0.1 metric tons CO2e per monitor emission reduction calculation = 2,500 metric tons CO2e

8. All equivalencies in this document are estimated using the methodology outlined by the U.S. Environmental Protection Agency, Greenhouse Gas Equivalency Calculator.

Applying the 10x carbon impact methodology

Carbon Trust and BSR collaborated with AT&T in the development of a methodology to measure the carbon benefits of AT&T's technology. The details of the methodology can be found on the AT&T 10x website. The table below summarizes how the 10x methodology was applied to estimate the environmental impacts described in this case study.

Description of the Enabling Technology	AT&T's connectivity enables the remote monitoring of cathodic protection rectifiers required to stop the corrosion of gas and oil pipelines, which can lead to leakages. Remote monitoring provides a more fuel and time efficient method to inspect pipelines by avoiding the need for the inspection team to travel long distances to inspect each rectifier site. Real-time scanning data is sent via AT&T's network to enable faster inspection.
Impact Category	This case study focuses on the reduced fuel usage resulting from the remote monitoring of rectifiers along the pipeline network and the GHG impact associated with these savings.
Materiality	Using sensors to remotely inspect rectifiers on a pipeline reduces the cost, emissions and time associated with the traditional method of inspecting rectifiers. The environmental and financial benefits arising from this approach enabled by AT&T connectivity could encourage widespread adoption of improved pipeline maintenance and management, thus delivering scalable environmental benefits.
Attribution of Impacts	The cost, emissions and time savings described in this case study are a result of changes to the pipeline inspection and maintenance practices supported by OmniMetrix sensor technology and AT&T IoT connectivity.
Primary Effects	The remote monitoring system reduces the need to frequently inspect each rectifier on site, and thus reduces the fuel and time used for inspecting and maintaining the pipeline.
Secondary Effects	The remote monitoring of rectifiers can potentially support the early identification of issues with the rectifiers. This allows for any potential risks of leakages to be addressed swiftly, thereby reducing leakages and the associated GHG emissions. It can also identify issues with ground beds, wiring (broken wires) and shorts on the pipeline.

Rebound Effects	No direct rebound effects were identified
Trade-Offs or Negative Effects	This technology does not appear to create other outsized or irreparable environmental or social impacts.
Carbon Burden from the Enabling Technology	The embodied carbon emissions of the sensors and IoT devices, which is assumed to be minimal.
Scope	The scope for this case study covers the difference in travel emissions between the inspection of pipeline rectifiers with and without remote monitoring.
Timeframe	Savings were calculated on a yearly basis, even though in-person inspections occur each month without remote monitoring and once a year with remote monitoring.
Functional Unit	The functional unit for the carbon emissions reduction is metric tons CO_2e per rectifier from reduced maintenance trips per year.

Methodology	The GHG emissions reductions were calculated by comparing the emissions associated with the number of inspections and the associated travel per year with and without remote monitoring. The distance travelled without remote monitoring was estimated by taking an average driving distance between each rectifier and assuming that each rectifier needs to be inspected in-person once per month. While PHMSA requires in-person inspections every two months if there is no remote monitoring, we've assumed a trip every month based on interviews with pipeline operators. The distance travelled with remote monitoring was estimated by assuming that each rectifier only needs to be inspected in-person once per year, per PHMSA requirements. The difference in distances driven was then converted into carbon savings using the truck emission factor from BEIS 2019.
Key Assumptions	• Emission factor of a large diesel car: 0.4177 $kgCO_2e$/mile • Average driving distance between rectifiers: 20 miles • Average number of rectifiers visited per day: 15 (average of 10-20) • Average distance between rectifiers: 10 miles • Number of inspections per rectifier per year without remote monitoring: 12 • Number of inspections per rectifier per year with remote monitoring: 1
Exclusions	• Potential reductions in emissions from a reduction in pipeline leakages. • Embodied and in-use emissions of the monitoring devices, data communication. and data processing. This is considered negligible compared to the overall energy use of the maintenance trips.

Data Sources	• Rectifier and remote monitoring sensors data provided by OmniMetrix • BEIS. Truck emission factor. Retrieved from https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019 • US pipeline network. Retrieved from https://www.phmsa.dot.gov/faqs/general-pipeline-faqs • EPA equivalencies. Retrieved from https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references
Carbon Abatement Factor	The result of remotely monitoring rectifiers across the pipeline network leads to total carbon savings of 0.1 tCO_2e per rectifier per year. Extrapolating this to 10% of the US pipeline network would lead to 2,548 tCO_2e carbon savings per year.
Lessons Learned	As there are many factors impacting the reduction in methane emissions from pipeline infrastructure it is very difficult to collect data and assess the impact of remote monitoring on the reduction in methane emissions.