

CASE STUDY

Delivering Design Efficiently for Gas Distribution Main Replacements

DTE Energy’s aging gas distribution infrastructure is being replaced through a multiyear main renewal program set to install approximately 200 miles of new polyethylene and cathodically protected steel mains throughout the state of Michigan annually. Strategically sequencing survey, design and permitting helped the utility meet construction and program schedules to maintain safe, reliable service.



Challenge

DTE Energy is a Detroit-based diversified energy company involved in the development and management of energy-related businesses and services nationwide. Its operating units include an electric company serving 2.3 million customers in Southeast Michigan and a natural gas company serving 1.3 million customers in Michigan. Like other natural gas utilities, DTE Energy faces the challenge of modernizing aging infrastructure while maintaining service to its customers and coordinating with a variety of permitting agencies.

To maintain its commitment to its customers, DTE is undergoing a long-term main renewal program to update its gas distribution infrastructure. The aim is to phase in new distribution mains, made from polyethylene and steel, and retire vintage cast iron, bare steel and dated plastic mains. Under the Gas Renewal Program (GRP), 20-mile grids of gas mains and bulk neighborhoods are identified for replacement, with the intent to fully replace DTE’s distribution system over the coming years.

Project Stats

Client

DTE Energy

Location

Detroit and Wyandotte,
Michigan

1.3M

natural gas customers

~200

miles replaced by the
program annually

60

miles designed in 2021 by
Burns & McDonnell

Additional projects include replacing at-risk or leak-prone mains of 1 mile or less and meter move-out projects that relocate meters from inside a resident's home to the outside for ease of maintenance. DTE has about 2,700 miles of distribution mains targeted for renewal, aiming to replace approximately 200 miles annually.

Solution

In 2021 under the program, Burns & McDonnell was entrusted with three neighborhood grid assignments and a municipal project in areas of Detroit and Wyandotte, totaling about 60 miles of distribution main replacement design. This was the firm's third year supporting the renewal program.

The team used a waterfall approach to execute survey, design and permitting. All assigned projects were reviewed and prioritized based on permitting duration with cities, the county, the state and foreign utilities as well as construction schedule. Under this waterfall approach, we were able to utilize a single survey company — which in combination with our quality review processes provided consistent deliverables — and stagger review meetings with DTE's program leads.

Initiating survey work quickly was critical to the project timeline. After reviewing the project scopes, we identified the following critical path items: city and client deadlines, railroad crossings, foreign utility crossings and various permit requirements. Based on the critical path items, lidar surveying was started to capture the topography and above-ground structures. For below-ground mapping, we contacted the Michigan utility safety notification system, MISS DIG, to obtain utility (SUE level C) atlas maps.

After surveying was completed and utility atlas maps were obtained, we could proceed with design. Our top design priority of our four assignments was a municipal-driven, 2-mile replacement that needed to be expedited due to deadlines relating to city construction activities. Next came a 19-mile replacement of distribution mains in Wyandotte. Major efforts for this project involved designing three railroad crossings with three different installation methods, including open cut, jack and bore, and horizontal directional drilling. This project was located within a municipality that had not been coordinated with previously; weekly city coordination meetings took place throughout the project. It also required permitting with the Michigan Department of Transportation (MDOT), two permits with Wayne County departments and notification to the Great Lakes Water Authority (GLWA) prior to construction.

The third neighborhood grid was a 28-mile replacement of distribution mains in Detroit that required permitting with MDOT and GLWA, as well as three permit applications with Wayne County. This project's scope entailed more than 100 drawing deliverables. For the final project of the year, the team focused on a meter move-out project, which included a 2-mile replacement and about 300 meter move-outs. The design was within the Detroit Central Business District and required generating maintenance of site-specific traffic plans, utility crossing profiles and additional municipal departmental reviews. Because this project also crossed a steam line, a 3D radial heat transfer study was needed to determine a safe minimum offset.

Before the designs could be finalized, all of the required permits had to be approved. Upfront communications and past coordination with municipalities and other authorities enabled early implementation of design requirements, notes and standards into the design sets. Since the drawing packages incorporated design considerations for the various permitting agencies, it streamlined the process of obtaining permits with minimal feedback.

Results

By maintaining a strict project schedule, all four assignments were completed on time. Doing so enabled the timely ordering of materials and opportunities to buy in bulk for material discounting. Relationships were fostered throughout the process with a number of cities, counties and state organizations. Once construction on these sites is completed, DTE Energy will be dozens of miles closer to replacing its gas distribution system and will have thousands of meters moved outside of customers' homes and businesses, supporting greater system reliability and easier maintenance.

On the strength of recent results, DTE has awarded the team another three years of partnership on the main renewal program.

About Burns & McDonnell



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