Union Gas Dawn to Parkway Expansion

Canadian Consulting Engineering Awards
Natural Resources, Mining, Industry and Energy

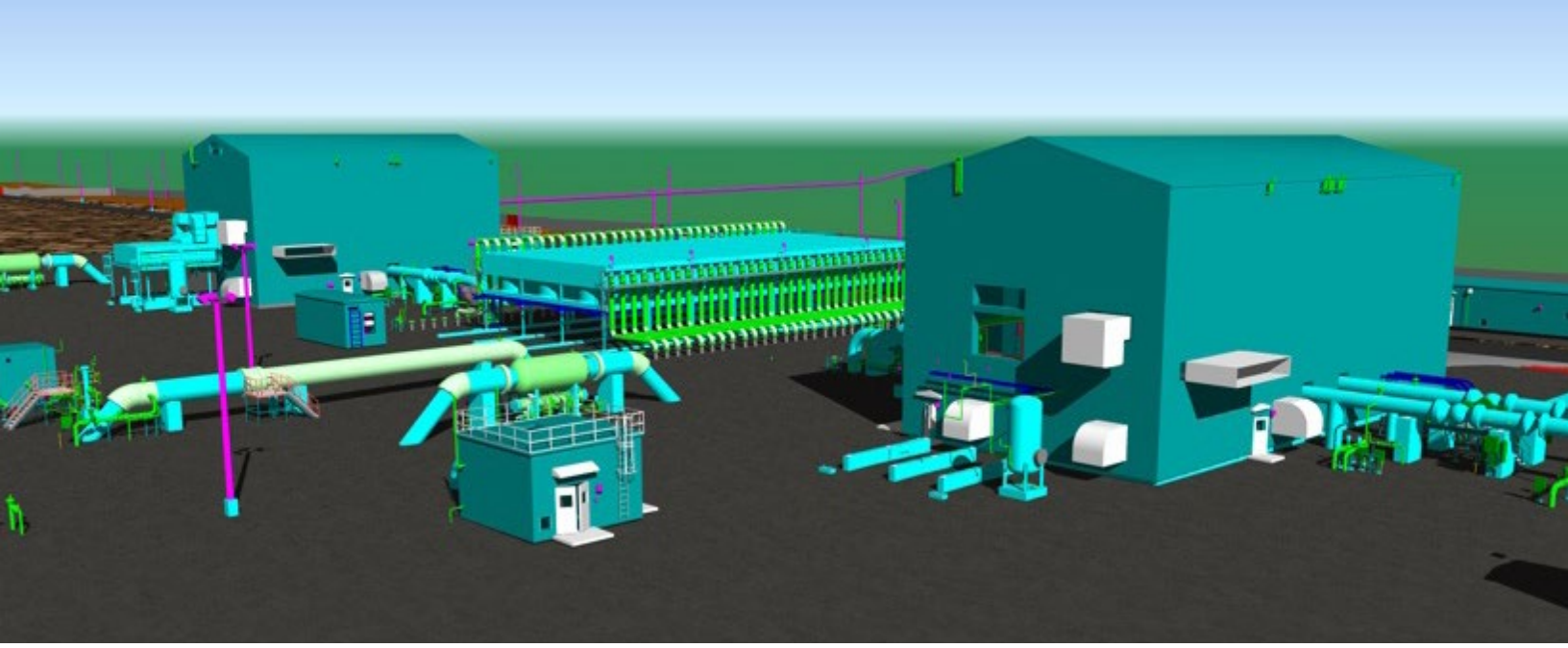
SUMMARY

With a growing population in the GTA and Ontario's move from coal to cleaner natural gas power generation, Union Gas sought to meet these trends with reliable and affordable natural gas supplies. Faced with location challenges and stringent requirements, WSP was engaged to design and support the construction of multiple compression facilities, as well as modifications to Canada's largest underground storage facility, with 274 billion cubic feet of natural gas storage.

PROJECT HIGHLIGHTS

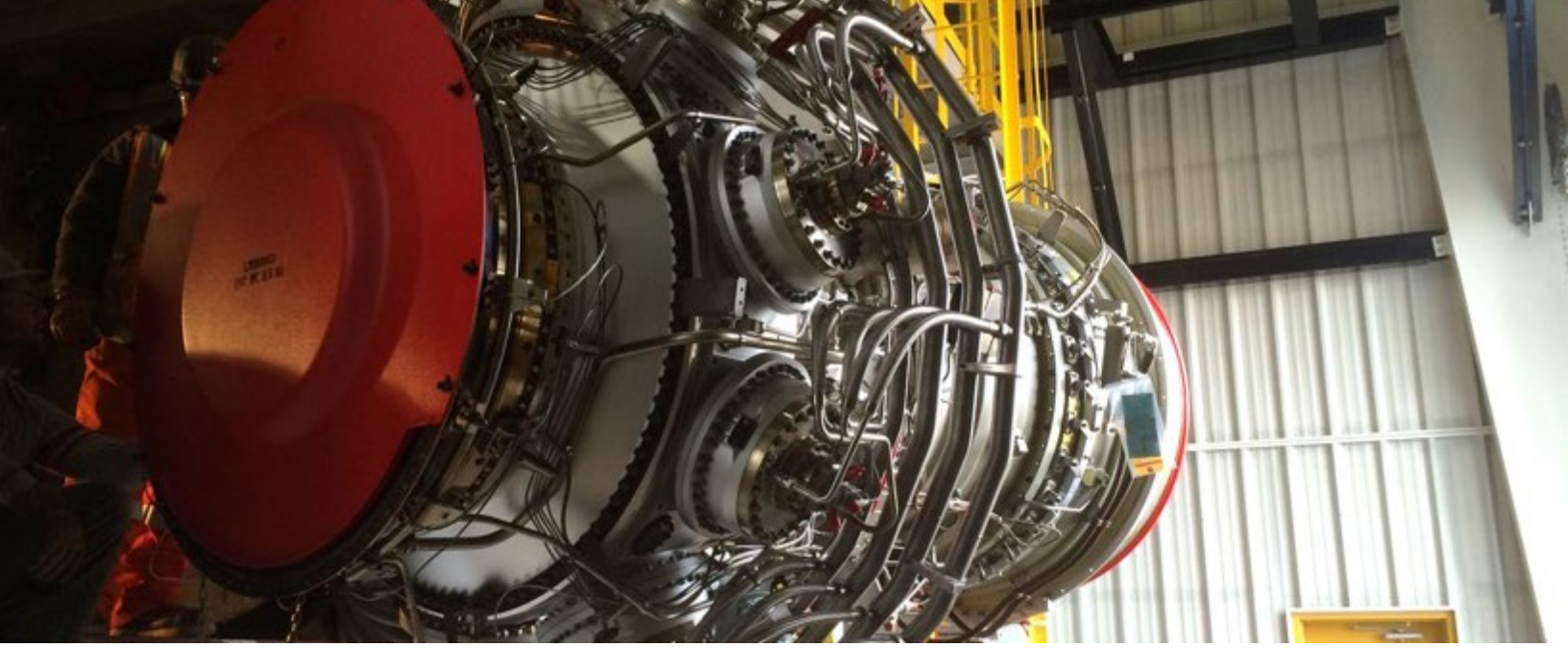
INNOVATION

The Dawn to Parkway Expansion Program included multiple projects including Parkway C & D, Lobo C & D, Bright C Compressor Stations as well as upgrades to the Dawn Hub (Dawn H Compressor Station), which was completed in 2017. All facilities were placed into service on schedule and on budget. The Dawn to Parkway System expansion will provide 1.3 PJ/d (1.2 Bcf/d) of incremental capacity for a total capacity of 8.2 PJ/d (7.5 Bcf/d), making it one of the most robust pipeline systems in North America and one that links important markets in eastern Canada and the northeast U.S. with the Dawn Hub.



The Parkway project (compressors C & D) was the only greenfield site of the expansion project, and served as the design template for the rest of the program. The key to a successful templating approach is to create a library of designs that are suited to various compressor packages and utilities to match, that are flexible enough to meet scope differences and location-specific challenges. By utilizing a standardized templated design package, engineering time was greatly reduced with realized efficiency savings of 10% in engineering man hours through each successive project to an ultimate savings of 50% of the original project. Engineering time was also reduced from a 16 month process to a 9 month window. Other significant benefits realized by our client included: spare and inventory management, standardized operations training, and staff flexibility across numerous sites with identical equipment.

Engineering and construction phases were staggered slightly at each site to allow for both engineering and construction resource leveling; in addition this allowed WSP and Union Gas to implement lessons learned from design, construction and operations perspectives to make valuable improvements at each site iteration. For instance, during the Parkway project, WSP saw a typical level of pipe spooling related RFI's (Request for Information), primarily due to the interpretation of the 3D model piping into the fabricators' spooling processes and software. Working with Union Gas and the Prime Contractor, WSP developed a process for engaging the Prime early in design to identify spool breaks and field welds, allowing the 3D model to match the Prime's ultimate build plan. Taking this construction input and developing a process to take our 3D model directly into their software and the shop floor, WSP was integrated into the fabrication process. The result was a reduction in pipe spooling related RFI's of 90% over rest of the projects.



COMPLEXITY

Minimizing impact on neighbouring communities

The Parkway site is located near heavily residential areas between the Town of Milton and city of Mississauga, Ontario. Residents were concerned with safety and noise, and key features were designed to mitigate these. As well, future residential expansion around the site, meant designs had to be future ready.

Noise: Wanting to be a good neighbour, Union Gas set challenging noise threshold targets for the facility that were 10 dBA less than provincial requirements. Parkway was designed to a maximum allowable noise limit of 35 dBA (as loud as a library) @ 100m. The gas turbine was selected in part because of its heavily silenced profile, as well as measures like insulation to reduce the noise of other compressors, auxiliary equipment, and gas carrying piping. The buildings housing the compressor package also was engineered to reduce noise, with all ventilation and exhaust openings fitted with baffled silencing hoods, and heavily insulated barn doors.

Safety: To meet stringent safety regulations, stormwater systems were redesigned at Parkway and Lobo to include firewater reservoir and pumping systems.

Unique location issues

The Parkway site had a regulated tributary that runs through the site as well as 3 heritage buildings and over a third of the 119 acres was designated as an Environmental Protection Area. The design team had to successfully design around this, as well as support construction around these sensitive locations. The Bright facility had an adjacent river to the station, dictating the need to redesign the existing stormwater system so that all runoff was accounted for.

SOCIAL AND/OR ECONOMIC BENEFITS

Energizing society and the economy

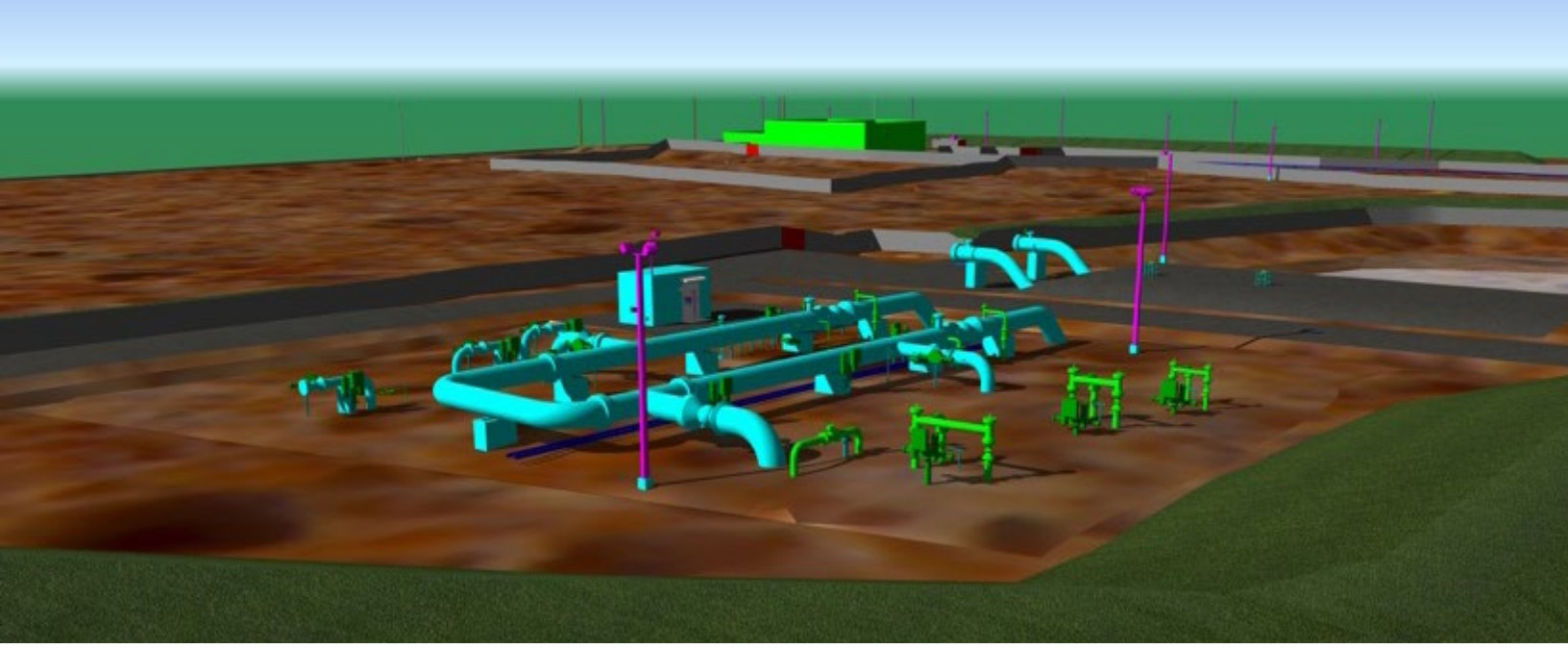
The Greater Toronto Area (GTA) represents one of the fastest growing urban centres in Canada, doubling in the next 50 years to 13.1 million. In order to support this tremendous growth, whether for our homes or businesses, reliable and affordable natural gas for heating and power generation is needed. The Dawn Hub, including the Parkway system, is strategically located in southwestern Ontario with multiple supply routes from western Canada, mid-continent, the Rockies, and the Gulf of Mexico, as well as the ability to serve markets in the mid-west, eastern Canada and the U.S. Northeast. The Dawn to Parkway system ensures Ontario homes and businesses can draw on abundant and affordable natural gas 24/7, 365 days a year. In fact, the Dawn Storage facility can hold enough natural gas to heat 2.4 million households all winter long.

Benefiting neighbouring communities

Designing for current needs as well as future residential development, Parkway's stormwater pond also supports the local fire department as their water supply. Ensuring the safety of the site as well as the residents around these industrial sites was important to our client and paramount to the success of the projects we delivered.

Social Responsibility and Indigenous Relations

Parkway features a one acre First Nations healing garden in the shape of a turtle accessible to the public. The client, through an extensive consultation process, used local First Nations expertise to design and build the garden featuring medicinal and traditional plants.



ENVIRONMENTAL BENEFITS

Innovative reduction of emissions on standard designs

The gas turbine package was selected by the client due to its high efficiency and dry low emissions (DLE) combustion systems significantly reducing CO_2 emissions as compared to other mechanical drive systems. Reduced emissions of CO_2 are not the only environmental benefit provided by gas turbines. Emissions of oxides of nitrogen (NOX), oxides of sulfur (SOX), carbon monoxide (CO), and particulate matter (PM 2.5) from gas turbines are at fractional levels of other combustion-based methods of mechanical drive applications.

The Gas Turbine Equation

High Thermodynamic Efficiency + Low Carbon Fuels = Low CO_2 Emissions

However, more could be done to reduce emissions without affecting reliability and at a reasonable cost. All gas compression systems must be periodically be taken off-line for maintenance, operational stand-by, or emergency shut down testing. When this happens, typically the high pressure gas remaining within the compressors and piping between isolation valves is vented to the atmosphere or flared, also known as blowdown. However, our approach was to design and build a system that captured this gas through a bypass and reinjects into the pipeline through a small compressor. This sub-project was called the Blowdown Recovery (BDR) Compressor System; BDR's were designed and installed at all four sites, Parkway, Bright, Lobo and Dawn. Other design solutions to reduce emissions included using various electric valve actuators versus traditional gas over hydraulic actuators. Gas over hydraulic valve actuators have small amount of gas emissions which were voided by using electric actuators.

MEETING CLIENT'S NEEDS

Our client's goals are to minimize the effects of their projects and operations on the environment, and enhance the quality of life of Ontarians with the safe and reliable distribution of natural gas. The project we delivered, ensures all aspects of these goals as demonstrated in the delivery of 1 greenfield (Parkway C&D) and 4 brownfield projects (Lobo C&D, Bright C and Dawn H), representing over 264,000HP of compression, 350,000+ diameter inches of welding, 250,000+ Engineering man hours, and 2M+ construction man hours. Our design and construction support resulted in the timely completion of the facilities, which met strict operational windows, ensuring end customers were not affected. As well, we implemented future ready designs with respect to emission management, environmental stewardship, being a good neighbour, all while reducing capital costs throughout the project. The key to designing and building 4 sites over a short period of time (3 years) was the use of templating design and full integration with the prime construction contractor.

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