PROJECT OVERVIEW

Station 130 is a brownfield compressor station site located in Vaughan, Ontario. The site has three existing compressor buildings:

- A-Plant (four obsolete reciprocating compressor units)
- P-Unit (stand-alone 6 MW turbine unit)
- B-Plant (two 11 MW turbine units)

The B-Plant compressor building was constructed in 2013 and was designed to house three turbo-compressor units. It currently has two 11 MW Solar Mars 100S-C65 refurbished gas turbines (B1 and B2) that are currently installed and operating in parallel with the existing P-Unit. The third bay is empty. In the original design, TransCanada included provisions for a future gas turbine unit addition similar to B1 and B2.

TransCanada has now determined that a third unit (B3) is required at Station 130 by November 1, 2016.

PRINCIPAL COMPONENTS OF PROJECT

For the site layout, see Attachment 2: Preliminary Station Yard Key Plan.

Based on the current preliminary design, the principal components of the Project are as follows:

- one new 11 MW (ISO rated) Solar Mars 100S-C65 16000 HP turbo-compressor package designated as Unit B3 in the Plant-B Building (see Key Plan ID 1)
- ancillary support systems for the new Unit B3 in the existing electrical and APU generator buildings already onsite (see Key Plan ID 3 and ID 4)
- four bays of air-cooled heat exchangers (ACHE) (see Key Plan ID 7)
- one skid-mounted control building to support the four bays of ACHE (see Key Plan ID 8), containing:
  - control systems
  - uninterruptible power supply (UPS) electrical switchgear
  - motor control centre (MCC)
- one skid-mounted auxiliary power unit (APU) generator building to support the four bays of ACHE (See Key Plan ID 9)
- one skid-mounted building to house the ACHE control valve (see Key Plan ID 12)
- one skid-mounted building to house the cold recycle line control valve (see Key Plan ID 10) to provide recycling functionality to both B-Units and P-Unit
- a single dry-type, pad-mounted step-down transformer for the primary incoming electrical feed (see Key Plan ID 13)

Yard Piping:

- discharge piping (NPS 24) from P-Unit to upstream of the ACHE
- station cold recycle piping (NPS 24) to provide recycling functionality to B-Unit and P-Unit
- Unit B3 suction and discharge piping (NPS 30)
- Unit B3 anti-surge recycle piping (NPS 24)
- Unit B3 fast-stop piping
- Unit B3 purge (load) and vent piping
- ACHE connection piping (NPS 20, NPS 36, NPS 42)

Valves:

- Unit B3 suction valve (NPS 30)
- Unit B3 suction purge valve
- Unit B3 discharge valve (NPS 30)
- Unit B3 discharge check valve (NPS 30)
- Unit B3 discharge vent valve
- Unit B3 anti-surge recycle valve (NPS24)
- Unit B3 anti-surge fast stop valve
- Unit B3 recycle isolation valve
- ACHE inlet/outlet isolation valves (2 x NPS 42)
- ACHE bypass control valve (NPS 20)
- ACHE secondary bypass valve (NPS 42)
- P-Unit isolation valves (2 x NPS 24)
- cold recycle control valve (NPS 24)
- cold recycle isolation valve (2 x NPS 24)

Utilities:

- additional overhead racks to accommodate electrical cable trays between coolers and new MCC and APU skidded buildings
- utility piping and air lines
- expansion of current compressed air systems
- skid-mounted fuel gas conditioning system

Electrical:

- an additional electrical transformer will be required to accommodate the increased load of the ACHE (coolers)
- electrical, control and communication wiring, lightning panel and grounding

Controls:

- a new I/O will be installed to support the B3-Unit
- emergency shutdown (ESD) control will be integrated in the current system architecture to accommodate addition of the third unit
- upgrade to control system programming and interface to control Unit B3 addition, as necessary
- upgrade Supervisory Control and Data Acquisition (SCADA) and Human Machine Interface (HMI) equipment and programming

Tie-ins and Leave to Open:

TransCanada plans to file for leave to open (LTO) during Project construction. Multiple packages may be submitted to prevent operational downtime and keep the facility in operation. LTO submission(s) will be based on construction scheduling requirements. See Attachment 2: Preliminary Station Key Yard Plan for the preliminary locations of proposed tie-ins:

- T1 – A/B: spool tie-in into suction line (NPS 42)
- T2 – A/B: spool tie-in into discharge line (NPS 42)
- T3 – A/B: spool tie-in into recycle line (NPS 30)
- T4 – ACHE inlet tie-in (NPS 42)
- T5 – ACHE outlet tie-in (NPS 42)
- T6 –A/B/C: tie-in for the cold recycle line into current B-Plant discharge piping downstream of ACHE
- T7 – Tie-in for P-Unit discharge piping into B-Unit discharge piping upstream of ACHE inlet tie-in T4 (NPS 24)
- T8 – P-Unit discharge tie-in (NPS 24)

Construction activities will include:

- grading, piling and foundations
- daylighting buried piping/valves/fittings (hydrovacing)
- installing all skidded buildings (MCC, APU, ACHE control valve building, cold recycle control valve building)
- installing compressor unit
- installing piping, valves and four bays of ACHE
- pressure testing (hydro testing), welding, NDE examination, and coating tie-ins and welds

- installing electrical components and affiliated programming/coding work for ancillary systems
- installing other ancillary support equipment and systems
- commissioning services
- pre-startup safety review
- final site cleanup

DESIGN

The proposed compressor station unit additions will be designed, constructed and tested in accordance with the provisions of the *National Energy Board Act*, *Onshore Pipeline Regulations*, TransCanada's specifications and the following standards:

- CSA Z662-15: Oil and Gas Pipelines
- ASME B31.3-2006: Process Piping
- CSA Z245.1-07: Steel Line Pipe
- CSA Z245.11-05: Steel Fittings
- CSA Z245.15-05: Steel Valves
- CSA C22.1 Electrical Code, Part 1: Safety Standards for Electrical Installations
- CSA C22.2 No-0-M91, General Requirements – Canadian Electrical Code, Part II
- 2007 ASME Boiler and Pressure Vessel Code, Section VIII, Division 1: Pressure Vessels
- National Building Codes of Canada (2005) and Ontario Building Code (2012)

INSPECTION OF EQUIPMENT

TransCanada will hydrostatically pressure test all high-pressure natural gas components of the installed facilities (including the yard piping) in accordance with the requirements of CSA Z662-15, Section 8 before placing them in service.

TECHNICAL DESCRIPTION[1]

Compressor Facilities	
Type and power of pumps/compressors	One Solar Mars 100 C65 turbo-compressor package consisting of a Solar Mars 100S 16000HP SoLoNox engine and Solar C65-2 centrifugal compressor.
Fuel type and source of pumps/compressors	The compressor package employs an aero-derivative gas turbine prime mover, which runs on pipeline quality natural gas. The natural gas is taken from the suction piping and is then filtered and regulated prior to injection into the combustors of the gas turbine.
MOP and Inlet / outlet design pressures	The station operating MOP is 6553 kPag. Inlet and outlet piping is designed to operate at 7240 kPag.
Piping outside diameter, wall thickness, grade and type	Compressor unit suction and discharge high pressure pipe will be NPS 30 x 16.4 mm wall thickness, grade 483, SAW Compressor unit recycle piping will be NPS 24 x 9.2 mm wall thickness, grade 483 Station yard piping will be a combination of: 1. NPS 42 x 16 mm wall thickness grade 483, SAW 2. NPS 36 x 13.7 mm wall thickness grade 483, SAW 3. NPS 24 x 9.2 mm wall thickness grade 483 SAW 4. NPS 20 x 8.2 mm wall thickness grade 448, EW 5. NPS 12 x 10.3 mm wall thickness grade 241, EW (SAW = Carbon steel submerged Arc Welded) (EW = Carbon Steel electrically welded)
Inlet and outlet temperature	-45C to +75C
Station schematic of buildings, relief valves	The existing B-Plant compressor building was constructed during the Station 130 (Maple) Compressor Upgrade Project in 2013. The 2013 upgrade project consisted of installing two units, with provisions for a third unit at a later date (the Project). B-Plant was designed to withstand loads as defined by the Ontario Building Codes, National Building Code, the Project service loads and applicable climatic conditions for the area. Unit B3 will be placed in the empty bay in the currently constructed B-Plant building at Station 130. The compressor building was built to be a free-standing steel rigid-frame structure, supported by reinforced concrete-grade beams and piles and completed with acoustically designed walls and roof. All new auxiliary buildings (ACHE MCC skid, ACHE APU skid, ACHE control valve skid, cold recycle control valve) are skid-mounted and are supported on steel-driven piles. The buildings are complete with heating and ventilation equipment. The discharge relief valve/blowoff valve will be sized for maximum rated flow rate from the compressor at a relief pressure as prescribed by TransCanada's Operating Procedure for Compressor Station Pressure Limits and Settings for the Canadian Mainline System. The design relief set pressure is 6553 kPag. Similarly, the suction relief valve/blowoff valve will be sized in the same manner and the set pressure will also be 6553 kPag.

[1] The information in this technical description is based on the current preliminary design and key yard plan, and is subject to change due to such factors as refinement of design and availability of equipment and materials. Where TransCanada makes a change in materials or equipment, it will be to materials or equipment of equivalent or better safety and performance for the chosen application.

Compressor Facilities	
Basic description of surge control system, pressure control and overpressure control	The recycle (anti-surge) valve is connected downstream of the compressor nozzle and upstream of the unit discharge check valve. The surge control valve is controlled by the unit Program Logic Controller (PLC) so as to ensure sufficient flow is available through the compressor at all times. Under conditions of extremely high head and low flow, the anti-surge valve will open, permitting gas to circle back into the compressor through the recycle piping. The unit PLC will ensure that the anti-surge valve will not close the unit valve until the compressor has come to a complete stop. Unit discharge pressure is controlled by the unit PLC which provides suitable commands to the compressor package to either slow or shut down the compressor when high pressures are encountered. The maximum set point of the discharge pressure controller is the MOP of 6553 kPag. System overpressure control is provided by a pressure limiting system and a pressure relieving system. The pressure limiting system consists of a Step-To-Idle (STI) control function to slow down the compressor or a high-pressure shutdown (HPSD) control setting to shut down the compressor when discharge pressure reaches 6553 kPag. The pressure relieving system consists of the suction and discharge pressure relief valve/blowoff valves. Each relief valve/blowoff valve is designed to ensure that the piping pressure will not exceed 6553 kPag under any condition.
Basic description of emergency shutdown	An emergency shutdown (ESD) pushbutton will be installed at all personnel doors in the compressor building and near the scrubber. Perimeter ESD pushbuttons will be added to all new gates and tied into existing fence ESD. New site ESD pushbutton will be added to the control panel in the relocated control building. ESD pushbuttons will trigger a station ESD. Fire and/or gas detection in new compressor building will also trigger a station ESD. Fire detection in the auxiliary buildings will cause an alarm.
Description of boilers and pressure vessels	The suction scrubber is pre-existing and was designed to handle the design flow. Automatic liquid level control is performed by the station PLC by actuating pneumatic operated control valves that will drain the scrubber liquids to an aboveground storage tank via an above-ground cyclone separator. A local pneumatic (natural gas) supply will be used to provide power gas to the liquid level valves. The scrubber will have a pressure differential gauge, pressure gauge, suction temperature RTD and thermowell. Boilers enclosed in the mechanical skid are expected as part of the glycol heating system for the units. All new pressure vessels will be built to TransCanada's specification for pressure vessels TES-MATL-PV1: Specification for Pressure Vessels.
Description of corrosion control elements	Both above- and below-ground piping will be coated. Below-ground piping will be coated with fusion bond epoxy per TransCanada's specification TES-COAT-FBE: External Fusion Bond Epoxy for Steel Pipe (CDN-US-MEX). Above-ground piping will be coated per TransCanada specification TES-COAT-P1: Paint Systems for Above-Ground Facilities (Coastal and Non-Coastal) (CDN-US-MEX). Active cathodic protection (CP) will be incorporated, as appropriate.