



# Enbridge natural gas storage

> Steckman Ridge Storage Facility, Bedford County, Pennsylvania

Enbridge owns or operates nine natural gas storage facilities in the United States (U.S.) and 36 natural gas storage fields at the Dawn Hub storage facility in Ontario, Canada, in addition to other Canadian facilities in Ontario and British Columbia, with a net working storage of 624 billion cubic feet (Bcf) across North America.

Enbridge engineers, builds, operates and maintains its storage facilities to meet – or exceed – all federal, state and provincial regulations.

These storage facilities provide natural gas producers and consumers with working capacity and the flexibility of interconnections with major pipelines to reach a variety of markets.

## Types of storage

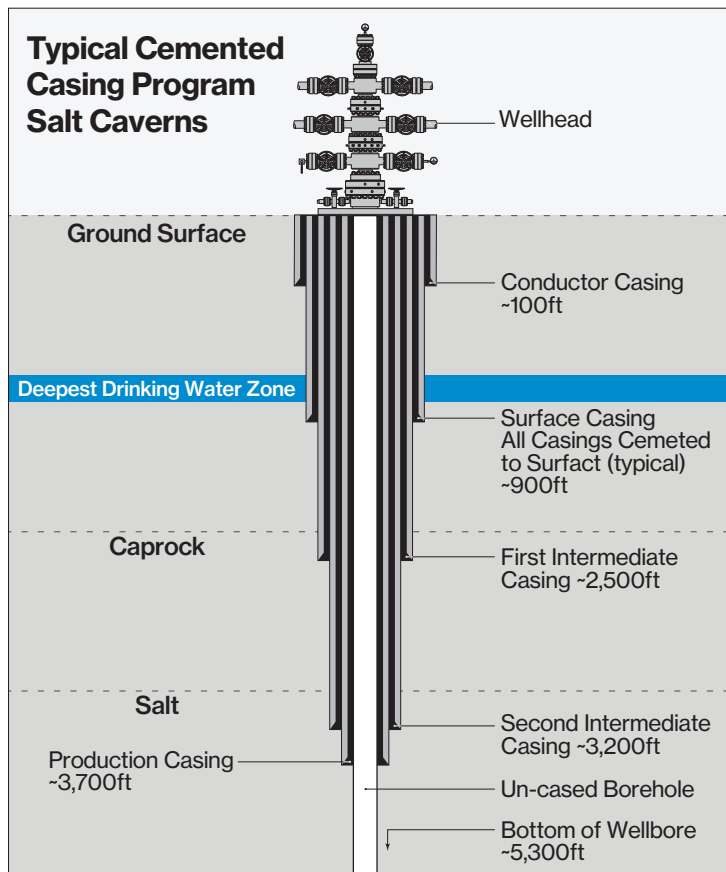
Enbridge's underground natural gas storage facilities are classified as either salt caverns or depleted reservoirs.

### Depleted reservoirs

- At depleted reservoirs, natural gas is injected back into underground fields or pools that once produced natural gas. The geological characteristics of the underground porous rock formations in the reservoirs allow natural gas to be stored safely and accessed efficiently.
- A depleted reservoir storage facility usually consists of numerous wells, a system of pipelines that link the transmission lines to the storage field or pools, and compressor station(s) to boost the pressure of the natural gas so it is able to flow between the field or pools and the transmission pipelines.

### Salt caverns

- Salt caverns, constructed in naturally occurring salt domes or salt beds, create strong and environmentally sound storage for natural gas. Salt is impermeable and self-sealing so stored natural gas does not escape.
- Water is used to dissolve and extract salt when creating a salt cavern, which can extend nearly a mile underground. Salt cavern storage also includes fresh water supply wells and handling facilities, brine handling facilities, and disposal wells, and a compressor station to provide the necessary pressure to move natural gas into and out of the caverns.



**20%**

Approximate amount of all natural gas consumed during the five-month winter heating season each year is supplied by underground storage

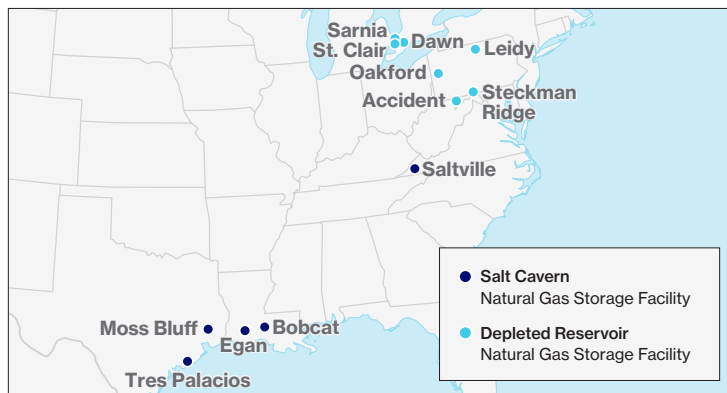
**400**

Approximate number of active storage facilities in 30 states

## Integrity management

Enbridge's integrity management program includes regular inspections of storage wells to identify integrity issues or metal loss. Inspections include three primary integrity components: the wellhead, wellbore and cavern or reservoir (or container).

- At each storage facility, Enbridge also conducts regular leak surveys, including foot and aerial patrols, and regularly upgrades and enhances facilities to ensure safe operations.
- Enbridge's storage wells are engineered so that inline inspection tools, or smart pigs, can inspect the entire vertical depth of the well casing (also known as production casing or final cemented casing) to detect any blockage, dents, or corrosion, and verify the thickness of the casing.
- Safety valves are installed at the wellheads of all Enbridge's natural gas storage facilities. At our salt caverns, these can be closed remotely by Enbridge's Gas Control center. At our reservoirs, these valves can be closed either manually or remotely by Enbridge's Gas Control center.



## Enbridge's storage facilities and regulators

Facility	Location	Net Working Capacity	Type	Regulators
Accident Storage	Accident, Maryland	18.3 Bcf	Depleted Reservoir	Maryland Department of the Environment
Aitken Creek	Fort St. John, BC, Canada	77 Bcf	Depleted reservoir	BC Oil and Gas Commission
Bobcat Gas Storage	St. Landry Parish, Louisiana	20.5 Bcf	Salt Cavern	Louisiana Department of Natural Resources (by authority of the U.S. EPA)
Dawn Storage <sup>1</sup>	Sarnia, Ontario, Canada	285.8 Bcf	Depleted Reservoir	Ontario Energy Board Ontario Ministry of Natural Resources and Forestry
Egan	Acadia Parish, Louisiana	19.4 Bcf	Salt Cavern	Louisiana Department of Natural Resources (by authority of the U.S. EPA)
Enbridge Gas Ohio	Multiple locations in Ohio	60 Bcf	Depleted reservoirs	Public Utilities Commission of Ohio
Leidy <sup>2</sup>	Leidy, Pennsylvania	15.3 Bcf	Depleted Reservoir	Pennsylvania Bureau of Oil and Gas Management
Moss Bluff	Liberty County, Texas	24.2 Bcf	Salt Cavern	Texas Railroad Commission (by authority of the U.S. EPA)
Oakford <sup>2</sup>	Oakford, Pennsylvania	40.7 Bcf	Depleted Reservoir	Pennsylvania Bureau of Oil and Gas Management
St. Clair Pool <sup>3</sup>	St. Clair Township, Ontario, Canada	1.18 Bcf	Depleted reservoir	Ontario Energy Board Ontario Ministry of Natural Resources and Forestry
Saltville	Saltville, Virginia	4.98 Bcf	Salt Cavern	EPA; Virginia Department of Mines, Minerals and Energy
Sarnia Airport Pool <sup>4</sup>	Sarnia, Ontario, Canada	5.94 Bcf	Depleted reservoir	Ontario Energy Board Ontario Ministry of Natural Resources and Forestry
Steckman Ridge <sup>5</sup>	Bedford County, Pennsylvania	12.0 Bcf	Depleted Reservoir	Pennsylvania Bureau of Oil and Gas Management
Tres Palacios	Matagorda County, Texas	38.9 Bcf	Salt cavern	Texas Railroad Commission (by authority of the U.S. EPA)

<sup>1</sup> Dawn storage total includes 2.7 Bcf operated by Enbridge on behalf of a third party

<sup>2</sup> Operated by Berkshire Hathaway Energy – Gas Transmission & Storage

<sup>3</sup> Owned and operated by Market Hub Partners, a wholly owned Enbridge Inc. partnership

- In 2011, Enbridge began working with the American Petroleum Institute (API), Interstate Natural Gas Association of America (INGAA), American Gas Association (AGA), and other stakeholders to develop more clarity around storage integrity management practices.
- Enbridge has been instituting these practices into its operations for the past nine years. In July 2015 and September 2015, respectively, API published recommended practices 1170 (“Design and Operation of Solution-Mined Salt Caverns Used for Natural Gas Storage”) and 1171 (“Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs”).
- Enbridge is working diligently to complete enhancements in order to meet these recommended practices within the required time frame.

## Regulatory oversight

### State/provincial

- Currently, each of the states and provinces we operate in has primary oversight of our storage facilities, and we work with each agency to ensure our facilities meet or exceed their requirements.

### Federal

- The Federal Energy Regulatory Commission (FERC) regulates storage projects connected to interstate pipeline systems. FERC is responsible for conducting an environmental review of proposed projects, and authorizing the construction or expansion of storage facilities and the terms and conditions of service (i.e. open access) and the rates charged by these providers.
- The Pipeline and Hazardous Materials Safety Administration (PHMSA) is authorized to regulate the safety of natural gas transportation and storage.

The Occupational Safety and Health Administration (OSHA) has regulatory oversight of the operation and maintenance of above-ground components and equipment associated with underground storage facilities.

<sup>4</sup> Market Hub Partners, a wholly owned Enbridge Inc. partnership, holds a 50% ownership stake in Sarnia Airport Pool

<sup>5</sup> Joint venture company with New Jersey Resources