

PROPOSED CHANGES TO ONTARIO REGULATION 245/97 UNDER THE OIL, GAS AND SALT RESOURCES ACT

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Ministry of Natural Resources and Forestry

COMPRESSED AIR ENERGY STORAGE PROJECTS IN POROUS ROCK RESERVOIRS

BACKGROUND / CONTEXT

What is compressed air energy storage? Why and how is it used?

Compressed air energy storage is a method of storing energy for future use by using compressed air as the energy storage medium. Electricity can be taken from the grid and used to compress and store air in a vessel. When required, the compressed air is reheated, expanded, and used to drive a generator to supply electricity back to the grid for local consumption. Air must be stored at significant pressure in order to produce electricity.

Compressed air energy storage can provide several services to electricity grids, including frequency regulation and voltage control.

Energy storage can store electricity during non-peak periods, which can then be used during peak demand periods. Energy storage can also support some renewable energy sources (e.g., wind, solar) by addressing their inherent intermittency.

Why is the Ontario government proposing these changes related to compressed air energy storage projects? Are there more opportunities coming for these types of energy storage projects in the future?

These changes are being proposed in response to industry concerns that there is no clear regulatory framework for compressed air energy storage projects in a specific type of porous rock reservoir that is often used for natural gas storage in Ontario. Ontario is committed to providing clear regulatory and business environments. We are ensuring that Ontario's regulations are effective, targeted, clear, and focused - while maintaining Ontario's high standards for public and environmental safeguards.

Ontario's electricity needs can largely be met with existing and available resources. Neither the Ontario government nor the Independent Electricity System Operator has any specific plans or programs targeting additional energy storage at this time.

Any future needs, including capacity and ancillary services, are expected to be procured through competitive processes. Storage projects are one way that proponents may choose to participate in future procurement processes.

PROPOSED CHANGES FOR ALL COMPRESSED AIR ENERGY STORAGE PROJECTS IN POROUS ROCK RESERVOIRS

The proposed regulatory changes would make all compressed air energy storage projects that propose to use subsurface porous rock reservoirs for storage subject to the *Oil, Gas and Salt Resources Act*.

For compressed air energy storage projects that meet specific criteria, the changes would establish technical, financial, notification/engagement and administrative requirements, enabling these projects to seek authorizations under the *Oil, Gas and Salt Resources Act* framework. Compressed air energy storage projects proposing to use porous rock reservoirs that do not meet the criteria would be prohibited.

Projects that meet all the following criteria would be able to apply for an approval under the *Oil, Gas and Salt Resources Act*:

1. The proposed project would use a pinnacle structure¹ for storage. This type of storage area is currently used for subsurface natural gas storage in the province.
2. The proposed project is located within a specific geographic area in southwestern Ontario (shown on Figure 1). This boundary represents an area where pinnacle structures that are suitable for storage are more likely to occur.
3. The proposed storage area must have been previously operated for hydrocarbon production or storage.

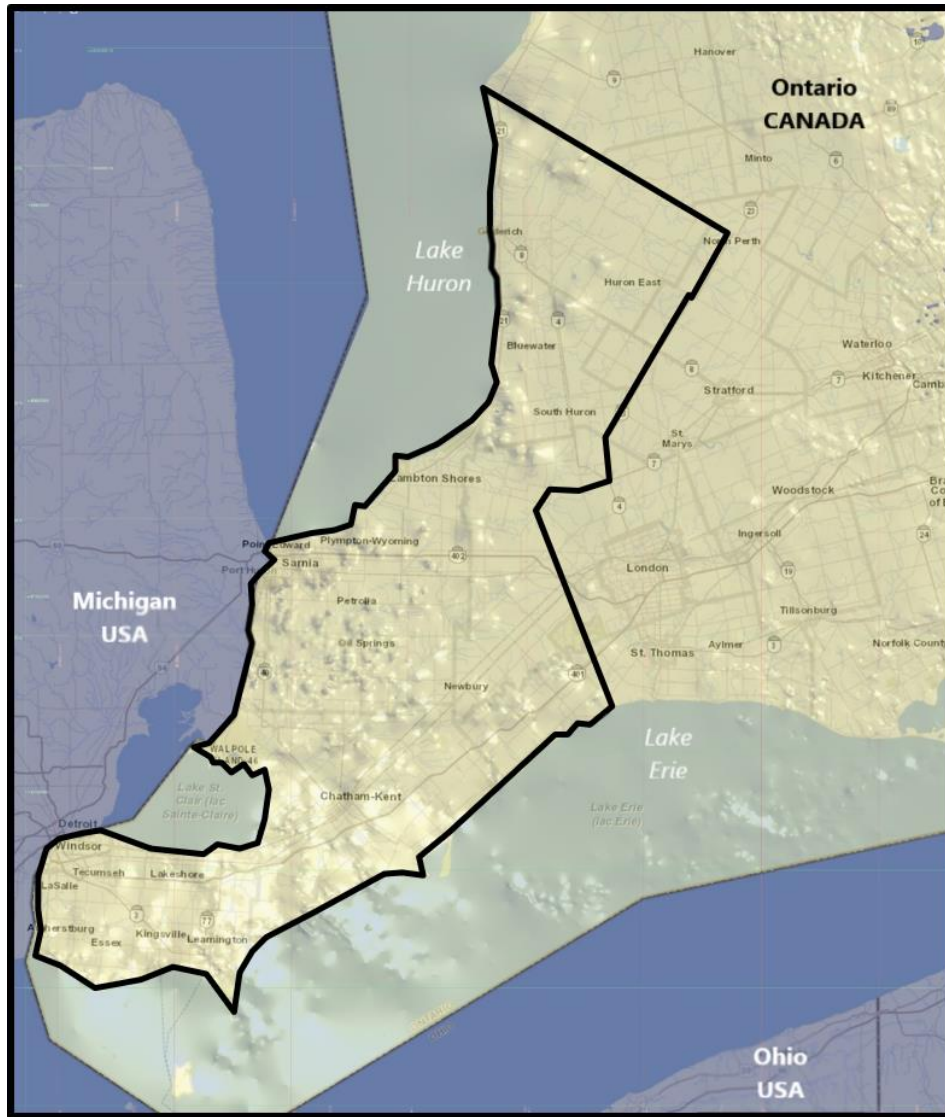
No offshore projects would be permitted, including those that would access offshore storage areas from horizontal wells on land.

The Ministry of Natural Resources and Forestry is proposing a prohibition of compressed air energy storage projects that would use porous rock reservoirs for storage but do not meet the criteria above because there is a need to better understand

¹ A 'pinnacle structure' is a 3-dimensional structure made up of layered carbonate rock that is a result of the thickening of geological formations in a confined geographic area. For the purpose of this proposal, the pinnacle structure must be within the Lockport Group of geological formations.

the nature of the potential risks associated with these projects to inform the development of appropriate regulatory controls. Should there be increased interest in developing compressed air energy storage projects in other porous rock areas in the future, regulation changes could be considered.

Figure 1: Geographic area in southwestern Ontario where compressed air energy storage projects in pinnacle structures must be located in order to seek approval.



SCOPE OF REGULATORY CONTROLS

As is the case for compressed air energy storage projects using salt caverns for storage, the proposed *Oil, Gas and Salt Resources Act* framework for projects using pinnacle structures would apply to the underground storage area and wells, up to and including the emergency shut down valves, as well as all pipelines, equipment, etc. associated with the drilling, completion, maintenance, servicing, overhauling, working over, abandonment, or decommissioning of a well or storage area.

Other surface activities and equipment (such as the surface electricity generation plant) that would not be addressed under the *Oil, Gas and Salt Resources Act* are generally subject to other existing approval processes and regulatory frameworks – for example, municipal approvals, environmental compliance approvals under the *Environmental Protection Act*, and regulations under the *Technical Standards and Safety Act*.

PROPOSED REQUIREMENTS FOR COMPRESSED AIR ENERGY STORAGE PROJECTS USING PINNACLE STRUCTURES

These projects would require a licence for each well to be used in association with the project. An injection permit, to authorize the injection of compressed air and any other substance into wells being used for the project, would also be required.

Note: These projects would eligible for authorization only if they use pinnacle structures that have previously been used for oil and gas production or storage. Oil and gas production activities that occur prior to compressed air energy storage activities would be subject to the existing framework for oil and gas exploration and development. Additionally, geological evaluation wells that may be required to inform the design/development of these projects would follow the existing framework for geological evaluation activities.

Compressed air energy storage in depleted gas reservoirs involves new technology that has not been fully demonstrated to date. To the Ministry's knowledge, the technology has not been demonstrated at a commercial scale anywhere in the world. As a result, there are currently no technical standards in place that have been developed to establish consistent parameters for the design, operation, and decommissioning of these projects.

The proponent, using qualified experts, would be responsible for developing site-specific plans and programs that address the design, installation, operation,

abandonment, decommissioning, and safety of individual projects. The determination of the appropriate codes, specifications, and standards to be relied on and used would be identified by the proponent's experts. Operations would be required, as a minimum, to follow the following sections of the [Oil, Gas and Salt Resources of Ontario Provincial Operating Standards](#). However, the proponent's experts would be required to evaluate whether the following minimum requirements are adequate and appropriate on a site-specific, case-by-case basis for individual projects and identify additional requirements that are necessary to provide for the protection of public and environmental safety.

Part 3: Well Drilling;

Part 4: Blowout Prevention;

Part 5: Works;

Part 6, Production (for all hydrocarbon production including reservoir preparation and operation)

Part 8: Well Servicing;

Part 11: Well Plugging;

Part 12: Oil, Gas and Salt Resources Trust; and

Part 13: Reporting

Compliance with these plans and programs would become a requirement for the project if approved under the *Oil, Gas and Salt Resources Act*. In order to provide additional assurance that plans for these projects are appropriately designed, and adequately protective of people and the environment, technical submissions provided in support of an application would be subject to an independent expert review. Further [details on independent expert review requirements](#) are outlined later in this proposal document.

Existing Requirements within Ontario Regulation 245/97

In addition to the proposed requirements for applications, insurance and financial security that are addressed separately below, it is proposed that the following requirements from [Ontario Regulation 245/97](#) would apply to compressed air energy storage projects using pinnacle structures:

- applicable definitions in section 1,
- sections 3 and 4 that deal with well licences and the drilling of wells, with the following modification:
 - due to the potential for a high number of wells, the 1-year timeframe for licence expiry and termination of authority to drill would be calculated

based on a date specified as a condition of the licence (e.g., a date on which the licence holder is authorized to commence drilling).

- annual well licence fees in section 5 would be modified to establish a fee of \$250/well for wells used for compressed air energy storage in pinnacle structures, consistent with fees required for other storage wells,
- provisions related to the registration of works in section 7 that require operators to submit and maintain up-to-date information about the operator and operation site,
- spacing and unitization provisions, in relation to any oil and gas production that may be involved in the preparation and operation of the storage reservoir, and
- sections 17, 19, 20.1, 21, and 22 that deal with well control and blowout prevention, plugging dry or unused wells, the release of information, and work tags,
- section 20, that deals with the protection of designated gas storage areas, would apply and would also be modified to expand this protection to compressed air energy storage pinnacle structure storage areas that are approved by the ministry, and
- section 23, related to Examiner qualifications and requirements for submission of reports, would apply with modifications to establish a new class of Examiner for these projects. It is proposed that an Examiner for a compressed air energy storage project using a pinnacle structure must be a Professional Engineer.

Note: *The existing statutory provisions of Oil, Gas and Salt Resources Act involving tribunals for referrals and appeals would apply to these applications and operations, in the same way they currently apply to other activities regulated under the act.*

- *Tribunal referral/appeal provisions in the act include those that relate to applications for licences and permits, transfers, conditions of approval, and situations where an approval is refused, suspended or cancelled as a result of an act or omission that comprises an offence under the act.*
- *There are two different tribunals to which matters may be referred/appealed under the existing framework – the Ontario Energy Board and the Mining and Lands Tribunal.*
- *Where a compressed air energy storage application for a project using a pinnacle structure is within 1.6 km of a designated gas storage area, or the minister is of the opinion that operations in a designated gas storage area would be affected, the matter must be referred to the Ontario Energy Board. Other referrals/appeals, if any, would be to the Mining and Lands Tribunal.*

Proposed Application Requirements

Proponents would be required to submit all licence applications (new wells and conversions) and injection permit applications for the authorization of new compressed air energy storage projects using pinnacle structures at the same time.

Proponents may consider staging their plans to seek authorizations for small-scale test or pilot projects prior to full scale development applications. Proponents who do not address full project staging in their initial application (e.g., they address only a test or pilot in the initial application), would be required to reapply and reconsult on the full-scale development proposal as a new application.

Application Fees

Current application fees for well licences and injection permits would be required at the time of application. These non-refundable fees are:

- \$100 for each well licence application, and
- \$500 for an injection permit application.

Submission Format requirements

- All application documentation would be required to be submitted in digital format.

General Project Information

As a part of the application, proponents would be required to provide information including the following:

1. information about the proponent,
2. details of the project location and current and surrounding uses, including maps,
3. details regarding land ownership, or lease arrangements granting the rights to conduct activities, demonstrating that the applicant has all the necessary rights to carry out the project at the time of application, and
4. a general overview of the proposed project and anticipated activities, all existing and proposed wells and the underground storage area that will be used in the storage project, and approvals being sought under the *Oil, Gas and Salt Resources Act* and other legislative frameworks related to the project.

Required Insurance

As compressed air energy storage in pinnacle structures involves new technology that has not been fully demonstrated to date, the appropriate insurance requirements are proposed to be evaluated on a case-by-case basis.

As part of their application, proponents would be required to submit a report, prepared by a qualified independent party with expertise in adequacy of insurance coverage for environmental and other risks and potential impacts of subsurface storage operations in southwestern Ontario, that provides recommendations on the type(s) and amount(s) of insurance coverage that the operator should carry including, but not limited to, liability and pollution coverage.

The report would be required to identify the information that was relied on to develop the recommendations.

Technical Submissions

Technical information provided in support of an application would be required to be prepared by specialized and qualified personnel (e.g., Professional Engineer, Professional Geoscientist). Individual assessments/reports would identify the responsible expert(s) and their relevant training/expertise in the subject field.

Applicants would be required to submit well and subsurface storage facility plans and programs that address the design, construction, operation, maintenance, monitoring, abandonment and decommissioning, and safety of all wells and works to be used throughout the lifecycle of the project. At a minimum, these plans and programs would address the following subject matter:

- well drilling and completion,
- reservoir development,
- well and subsurface storage facility integrity,
- operation and maintenance of wells and subsurface storage facility,
- emergency management and response,
- well and subsurface storage facility plugging, abandonment and decommissioning, including a detailed schedule of estimated costs to carry out the required plugging, abandonment, and decommissioning activities,
- the proposed boundary for the storage zone that establishes the furthest extent of the subsurface storage zone, and includes all wells used in association with the project,
- the proposed boundary for the storage area, including the storage zone and any adjacent areas where future subsurface activities would not be recommended by the proponent's experts due to the potential to interfere with the compressed air energy storage, and
- project schedule(s).

These plans and programs would be required to address any monitoring, mitigation, record keeping and reporting requirements, as well as any specialized training required for personnel conducting activities related to the plan.

The plans and programs submitted by proponents would also be required to be supported by detailed technical analyses, submitted with the application, including, at a minimum:

- assessment of existing and proposed neighbouring surface features, activities, users, and uses, identifying potential impacts of the proposed project on these neighbouring activities and vice-versa,
- assessment of existing and proposed neighbouring subsurface activities, users and uses, identifying potential impacts of the proposed project on these neighbouring activities and vice-versa,
 - this assessment would include consideration of any plugged or unplugged wells or other vectors (e.g., *Oil, Gas and Salt Resources Act* wells, geothermal wells, water wells, and any other holes drilled into bedrock that could be a potential pathway for migration of stored substances) located in the vicinity of the storage area.
- risk assessment that addresses the full lifecycle of the project, including assessment of unmitigated or residual risks, and plans to mitigate risks to a level that is as low as reasonably practicable,
- detailed geological and geochemical evaluations clearly identifying reservoir spill points, rock and fluid properties, stratigraphy, cap rock testing, etc.
- reservoir modelling considering all flow, pressure and gas composition conditions suitable for input to geo-mechanical numerical modelling, and ensuring explosive mixtures are not formed, etc.
- geo-mechanical analysis of the storage zone considering all conditions such as maximum / minimum pressures, flow conditions, cyclic stress and delta-pressuring, etc. Analysis must be supported by numerical modelling, sufficient rock cores and laboratory testing, including cap-rock testing.

Independent Expert Review of Technical Information

Technical submissions would be subject to independent expert(s) review.

Once the application is submitted, the ministry would identify to the proponent which technical submissions, or parts thereof, will require review by an independent expert. A service standard will be applied to give business some certainty. All costs associated with the expert review would be paid by the proponent.

As with the original development of plans, programs and technical analyses, the independent expert must be qualified to perform the work, and the ministry and the

proponent must agree on the expert selected. The expert who performs the review would be required to submit their report directly to the ministry.

The expert review would be required to be completed prior to the mandatory notification and engagement steps outlined in the following section.

Notification and Engagement Requirements

Proponents would be required to notify the following parties of the application, providing a project description and offering to provide digital copies of any application documentation², including any expert review documentation, on request:

- landowners, local municipalities, and regional municipalities within 750 m of the proposed boundary of the storage area,
- landowners for any wells that are not regulated under the *Oil, Gas and Salt Resources Act* (e.g., water wells, geothermal wells), where the well is within 1 km of the proposed boundary of the storage area,
- operators of licensed *Oil, Gas and Salt Resources Act* wells located within 1 km of the proposed boundary of the storage area,
- operators of any gas storage area designated under the *Ontario Energy Board Act* located within 1.6 km of the boundary of the storage area, and
- utility operators, if an easement exists within 750 m of the proposed boundary of the storage area and any wells proposed to be used for the project

In addition to the above notifications, proponents would be required to submit a complete application package to any municipalities, ministries, or agencies that the Ministry of Natural Resources and Forestry identifies.

The Ministry of Natural Resources and Forestry would also identify the Indigenous communities and organizations that the proponent would be required to notify of the application. The requirements for engagement or consultation with Indigenous communities would be determined by the ministry on a case-by-case basis.

Any party or person notified of the application would have an opportunity to provide comments to the applicant by mail or email within 60 days of receiving the notice.

Summary of Notification and Engagement

Applicants would be required to provide documentation to the Ministry of Natural Resources and Forestry summarizing their notification and engagement activities, the

² [Section 20.1 of Ontario Regulation 245/97](#) provides a process for applicants to redact certain types of information from technical documents that is confidential in nature from documents to be shared under this proposed process.

comments or responses received, any changes made to the application in response to the comments, and an explanation of any concerns from notified parties, with respect to the application, which have not been addressed.

Any comments provided to the applicant from persons not directly notified of the application, prior to the submission of the summary document, would also need to be included.

A separate summary of notification and engagement with Indigenous communities and organizations would be required.

Applicants would be required to take all reasonable steps to ensure that any personal information collected under the proposed notification and engagement process is retained, transferred and disposed of in a secure manner so as to protect the information against theft or loss or unauthorized use or disclosure.

Insurance and Financial Security Requirements

It is proposed that insurance requirements for compressed air energy storage projects using pinnacle structures would be established on a case-by-case basis, through conditions attached to the *Oil, Gas and Salt Resources Act* licences and permits(s), based on the recommendations provided in the independent expert advice submitted by or on behalf of the proponent with the application.

Financial security requirements for the plugging, abandonment, and decommissioning of the wells and subsurface storage facility would be established in the regulation. The amount and form of this security would be determined as follows:

- The amount of the security would be equal to the amount forecasted by the proponent as a part of their abandonment and decommissioning plans, unless the Ministry of Natural Resources and Forestry determines a higher amount of security reflects a more accurate estimate of the costs of abandonment and decommissioning, based on
 - a. any independent expert review of the applicant's estimate required as a part of the application process,
 - b. any information provided by a person or organization provided during the application process, or
 - c. any records or information the ministry has pertaining to the cost of abandoning or decommissioning similar facilities in Ontario or other jurisdictions.

The proponent would be aware of any information that is available in a. through c., above, as it would have been provided to them as a part of the application

process. However, they would also be notified by the ministry of the increased financial security amounts and the reasons for the increase.

- The form of security would be required to be provided or established in:
 - a. a trust, in accordance with the existing provisions of the regulation (section 16), or
 - b. an irrevocable letter of credit.

While the changes to financial security outlined above would only apply to compressed air energy storage projects using pinnacle structures, the ministry is considering changes to financial security requirements for other types of wells that are already regulated under the *Oil, Gas and Salt Resources Act* framework (e.g., oil and gas, salt, hydrocarbon storage) as well. Any changes to existing security requirements would require amendments to the regulation and would therefore be subject to consultation processes.

OTHER TECHNICAL AND ADMINISTRATIVE CHANGES IN THE REGULATION AND ASSOCIATED STANDARDS

UPDATING REFERENCES TO EXTERNAL TECHNICAL STANDARDS, SPECIFICATIONS AND CODES

Changes are also proposed to all Provincial Standards, which are incorporated by reference into the regulation under the act, in order to reference the most current version of specifications, codes, standards, etc.

These standards, codes, etc. are referenced in the [Oil, Gas and Salt Resources of Ontario Provincial Operating Standards](#), and the [Provincial Standards for Compressed Air Energy Storage](#) (which apply only to cavern compressed air energy storage).

These proposed changes would update references to all external standards (e.g., those produced by the Canadian Standards Association and American Petroleum Institute) which are developed through processes that have been accredited by third-party organizations such as the Standards Council of Canada. Going forward, this would ensure that the most current version of the standard would always apply.

Examples of the types of standards, codes, and specifications referenced include:

American Petroleum Institute (API)

API 5C4	Bulletin on Round Thread Casing Joint Strength with Combined Internal Pressure and Bending
API RP 5C1	Recommended Practice for Care and Use of Casing and Tubing
ANSI/API RP 651	Cathodic Protection of Aboveground Petroleum Storage Tanks
API Spec 12P	Specification for Fiberglass Reinforced Plastic Tanks
API Spec 5CT	Specification for Casing and Tubing
ANSI/API Spec 6A	Specification for Wellhead and Tree Equipment

Canadian Standards Association (CSA)

CSA Z341	Storage of hydrocarbons in underground formations
CSA Z662	Oil and gas pipeline systems

ADMINISTRATIVE UPDATES TO EXISTING REGULATION PROVISIONS RELATED TO TRUSTEES

Section 16 of *Ontario Regulation 245/97* identifies different parties that may act as Trustee for plugging/decommissioning security trust funds under the *Oil, Gas and Salt Resources Act*. Banks and Credit Unions are proposed to be removed from the list of potential Trustees, as they are prohibited from acting as trustees under other legislation.