



## Monitoring Plans in Offshore Greenhouse Gas Injection Licences and Site Plans

All fact sheets should be read in conjunction with the [Offshore Petroleum and Greenhouse Gas Storage Act 2006](#) (the **OPGGS Act**), associated regulations, relevant guidelines and policies (available on [NOPTA's website](#)).

This fact sheet provides general information about monitoring plans to be included as part of the application and assessment processes for a greenhouse gas (GHG) injection licence and site plan(s).

It remains the responsibility of project proponents to ensure compliance with all legal requirements for a project. Project proponents should ensure consistent information is provided to all regulators.

There are multiple legislative frameworks to regulate offshore carbon capture and storage (CCS) projects in Commonwealth waters including:

- *Offshore Petroleum and Greenhouse Gas Storage Act 2006*;
- *Environment Protection (Sea Dumping) Act 1981*; and
- *Environment Protection and Biodiversity Conservation Act 1999*

The responsibilities for regulating offshore CCS projects are shared across the Commonwealth Government's Department of Industry, Science and Resources (**DISR**) and the Department of Climate Change, Energy, the Environment and Water (**DCCEEW**).

The four regulatory bodies that are relevant to offshore CCS projects are:

- National Offshore Petroleum Titles Administrator (**NOPTA**);
- National Offshore Petroleum Safety and Environmental Management Authority (**NOPSEMA**);
- Sea Dumping (within DCCEEW); and
- Nature Positive Regulation Division (within DCCEEW).

Further information on regulatory approvals can be found in: [Offshore Carbon Capture and Storage Regulatory Approvals](#)

Due to the complexity and interactions between the OPGGS Act and associated regulations with other legislative and regulatory frameworks, early and ongoing engagement with the relevant regulators is encouraged. Every project is unique and may require additional approvals to those outlined.

This fact sheet should be read in conjunction with the OPGGS Act and the [Offshore Petroleum and Greenhouse Gas Storage \(Greenhouse Gas Injection and Storage\) Regulations 2023](#) (**GHG Regulations**) and the following guidelines:

- Guideline: Offshore Greenhouse Gas Injection Licences (**Injection Licence Guideline**); and
- [Offshore GHG Guideline - Declaration of Identified GHG Storage Formation Guideline \(DoSF Guideline\)](#)

The [Offshore Petroleum and Greenhouse Gas Storage \(Resource Management and Administration\) Regulations 2011](#) (**RMA Regulations**) contain some explicit reporting requirements and applicants should be aware of these reporting requirements in addition to the monitoring plan.

Risk assessment is also a key component of site plans and is interlinked with the development of monitoring plans. Further guidance on risk assessment is provided in a separate fact sheet, Risk Assessment in Offshore Greenhouse Gas Injection Licences and Site Plans.

### Where does monitoring fit into a site plan?

A draft site plan must accompany an application for a GHG injection licence, and must meet certain criteria under the GHG Regulations including:

- Section 18 of the GHG Regulations – general criteria;



- Section 19 of the GHG Regulations – criteria for Part A
- Section 20 of the GHG Regulations – criteria for Part B.

The monitoring plan forms part of the information required in Part B of the draft site plan, as outlined in section 20 and Schedule 2 of the GHG Regulations.

The draft site plan must be approved by the responsible Commonwealth Minister (**RCM**) before any operations in relation to an identified GHG storage formation specified in the licence can commence and the licensee must comply with the plan. The *Developing a GHG resource – GHG Licence and Site Plan applications fact sheet (Injection Licence Fact Sheet)* provides more detail on the assessment and approvals process for a draft site plan.

The draft site plan must also include a description of the infrastructure facilities and the proposed operations for the plan (clause 3, Schedule 2 of the GHG Regulations), which should include the equipment and procedures for measuring the composition and quantities of GHG substances (refer to Appendix A of the Injection Licence Fact Sheet).

## What should be included in a monitoring plan?

Monitoring plans (also known more generally as monitoring, measurement and verification (**MMV**) plans) are to be designed for:

- measuring the quantities and composition of the GHG substance injected into the declared storage formation;
- monitoring the behaviour of stored GHG substances in the storage formation; and
- the detection and monitoring of leakage of GHG substances from the overall project.

The monitoring plan should also be designed to satisfy the regulators that the key project risks are being monitored and addressed.

As part of the monitoring plan, applicants should include the following information:

### *Measurement<sup>1</sup>*

The monitoring plan should include details on the measurement of the quantities and composition of the GHG substance injected into the formation(s).

Measurement of these parameters is necessary to carry out the monitoring plan. There will be a future fact sheet on the reporting requirements regarding measurement in the future (see footnote).

The following points on the measurement of GHG substances should be based on good oil field practice:

- proposed approaches for verifying the accuracy of the measurement of the quantities of the GHG substance injected into the formation and the water that has been produced or injected;
- standards or codes of practice for metering equipment;
- proposed procedures to be used for measuring the GHG substance for reporting or compliance monitoring purposes;
- measures to verify the composition of the GHG substance; and
- the injection pressure, temperature and flow rate at both the wellhead and at the bottom of the well bore.

### *Monitoring plan – behaviour*

A plan for monitoring the behaviour of GHG substances in the declared storage formation(s) set out in sufficient detail to demonstrate, as required by clause 6, Schedule 2 of the GHG Regulations, that:

- significant events in the reservoirs and seal will be detected in a timely manner to enable any necessary mitigation and remediation activities to be initiated; and

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<sup>1</sup> The RMA Regulations have reporting requirements for injection licences that require measurement and verification of the quantities and composition of the GHG substances injected into the storage formation and any fluids produced from the storage formation.



- the timing and nature of the monitoring will detect any variations from the predictions set out in Part A of the draft site plan.

#### *Proposed substances for facilitating monitoring*

Details (including concentration) of any substance that is proposed to be used to facilitate the monitoring of the behaviour of a GHG substance.

#### *Events that could be reportable incidents*

A description of each event in the behaviour of a GHG substance in the formation that, if it causes, or has the potential to cause, a **serious situation** (refer to section 379 of the OPGGS Act) to exist in relation to the formation, will be a reportable incident in relation to the formation, being events such as the following:

- a departure from the predicted migration pathway(s) of a GHG substance; and
- a departure from the predicted migration rate(s) of a GHG substance.

Note. If the monitoring plan detects a reportable incident (section 49 of the GHG Regulations) it will trigger the need for the licensee to notify and provide a report to the RCM in relation to the reportable incident.

#### *Detecting and monitoring leakages*

A program for detecting and monitoring leakage of GHG substances (clauses 6, 7 and 8 of Schedule 2 of the GHG Regulations):

- stored in the formation to the seabed;
- that could potentially occur during transport for the purpose of injection into the formation;
- at the point of injection into the formation; and
- from a well bore.

The program should be aligned with the project risk assessment outcomes and enable early detection of leakages to enable action to be taken to remedy or mitigate the leakage as soon as practicable.

#### *Site closure – monitoring*

A plan for monitoring the behaviour of the GHG substances stored in the formation after the ceasing of operations for the injection of GHG substances into the

formation (subclause 9(2) of Schedule 2 of the GHG Regulations). Similar information is also required in the application for a site closing certificate (paragraph 386(2)(c) of the OPGGS Act).

### **Developing a monitoring plan**

The monitoring plan is developed to ensure that any necessary mitigation and remediation activities can be initiated as soon as practicable to ensure prompt notification/advice to the RCM and action to remedy the situation in the event that any variation in the behaviour of the GHG substances as set out in the draft site plan or leakage of GHG substance occurs.

The monitoring plan should be based on industry best practice and should be comprehensive and dynamic and tailored to a site-specific risk assessment.

This site-based risk assessment, using tools such as a risk assessment matrix or the bow-tie methodology, should identify the various risks, evaluate potential impact of these risks and develop mitigation plans for safe long-term storage of GHG substances. The outcome of this risk assessment should drive the strategy of the monitoring plan.

Major risks may include;

- unexpected migration of the GHG substance plume;
- reservoir architecture uncertainty and the impact on injectivity and storage capacity;
- integrity of injection, monitoring and legacy wells; and
- loss of containment from the overall project.

It is also expected that monitoring plans will incorporate planning for the evolution of monitoring technologies and best practice. It is expected that the first phases of the monitoring program will use proven technologies and that later phases, once the behaviour of the plume has been established, may incorporate new or emerging technologies in conjunction with proven technologies to demonstrate their effectiveness. The use of new and emerging technologies not included in the initial draft site plan can be included in subsequent reviews of the approved site plan.



Information provided in Part B of the draft site plan should reflect best understanding at the time of the application. Variations may be required during the injection phase as information is obtained during operations.

When developing a monitoring plan the following should be considered:

- baseline monitoring, including a pre-injection baseline data collection program, to establish the subsurface and environmental conditions prior to the injection of GHG substances.
- a comprehensive screening of existing, new or emerging monitoring technologies and justification for the monitoring technologies selected;
- resolution, accuracy, sampling frequency, reproducibility, spatial coverage, capability, response timing and detection limits of monitoring technologies;
- demonstration of a sufficient link between the monitoring plan and identified project risks, and any risk elimination or control measures that may be undertaken;
- steps taken to understand potential reasons for deviation from predicted behaviour and adaptive management to consider a range of corrective actions including recalibration of pre-injection modelling undertaken as part of the DoSF and requirements for additional data or monitoring if significant deviations occur; and
- plans for monitoring the behaviour of GHG substances stored in the formation after the ceasing of operations for the injection of GHG substances.

The above points should be considered when developing each part of the monitoring plan to meet regulatory requirements as outlined in the previous section.

Early engagement with NOPTA and NOPSEMA is strongly encouraged when developing a monitoring plan.

## When are monitoring plans reviewed?

The approved site plan, including the monitoring plan, must, at least once in each period of 5 years during which it is in force, be reviewed (sections 36 to 38 of the GHG Regulations). The review cycle should be linked to the planned GHG plume migration with, where applicable, any significant deviation from the modelled behaviour triggering a review of the approved site plan. The review must take into account:

- in relation to the predictions set out in Part A of the approved site plan:
  - the experience gained about the predictions
  - the carrying out the operations authorised by the licence; and
  - the monitoring of migration pathways;
- in relation to the following plans and programs set out in Part B of the approved site plan, the evolution of industry best practice and the carrying out of operations must be taken into account:
  - the plan for monitoring the behaviour of GHG substances stored in the formation;
  - the program for detecting and monitoring leakages of GHG substances during transport and injection;
  - the program for detecting and monitoring leakages of GHG substances from well bores; and
  - the plan for carrying out any work that is required to remediate the formation.

New or emerging technologies that could be used as part of the monitoring plan should also be considered in the reviews.

As part of the licensee's review, the licensee must decide whether the approved site plan (including the monitoring plan) should be varied. If the licensee decides that the plan should be varied, it must provide a draft variation of the plan to the RCM within 180 days (or a longer time if the RCM agrees).

Reviews can also be requested by the RCM if any of the following apply:



- the licensee applies, under section 313 of the OPGGS Act, for a variation of the declaration under section 312 or section 312A of the OPGGS Act (as applicable) in relation to the storage formation;
- the licensee applies, under section 374 or section 374A of the OPGGS Act (as applicable), for a variation of a matter specified in the licence; or
- a reportable incident in relation to the formation occurs.

Within 60 days of that request (or a longer period if specified by the RCM), the licensee must:

- review the plan, taking the matters mentioned above into account,
- decide whether the plan should be varied,
- give the RCM notice of that decision, and
- if the decision was that the plan should be varied, give the RCM a draft variation.

## More information

If you have any specific questions, please contact [ghg@nopta.gov.au](mailto:ghg@nopta.gov.au).

*Please note: this document is intended as a guide only. It is subject to, and does not replace or amend the requirements of, the Offshore Petroleum and Greenhouse Gas Storage Act 2006 and associated regulations, which should be read in conjunction with this guideline. It should not be relied on as legal advice or regarded as a substitute for legal advice in individual cases.*

## Version history

Version	Date	Comment
1.0	02/01/2025	New GHG fact sheet