CO2Tech
A CO2CRC Company

Technical Advisory and Consultancy Services

Navigating the CCS regulatory minefields: Your optimal pathway to storage may not be straight!

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Purpose

Provide an overview of the regulatory processes and pathways that must be followed and satisfied (i.e., approved by the regulator) to move from the existing early GHG exploration-evaluation phase through to the future mature stages, involving commercial CO_2 injection and permanent storage

Highlight some of the key challenges that are inherent within the existing regulatory framework and emphasise the pitfalls for “young players” - and we are all young players in this, including the regulators

CO2CRC Techno-Regulatory Framework

What is the status of GHG Storage and CCSUS in Australia?

The regulatory framework: navigating the maze on the Pathway to Storage

Opportunities & pitfalls

Discussion

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What is the status of CCS and CCSUS in Australia?

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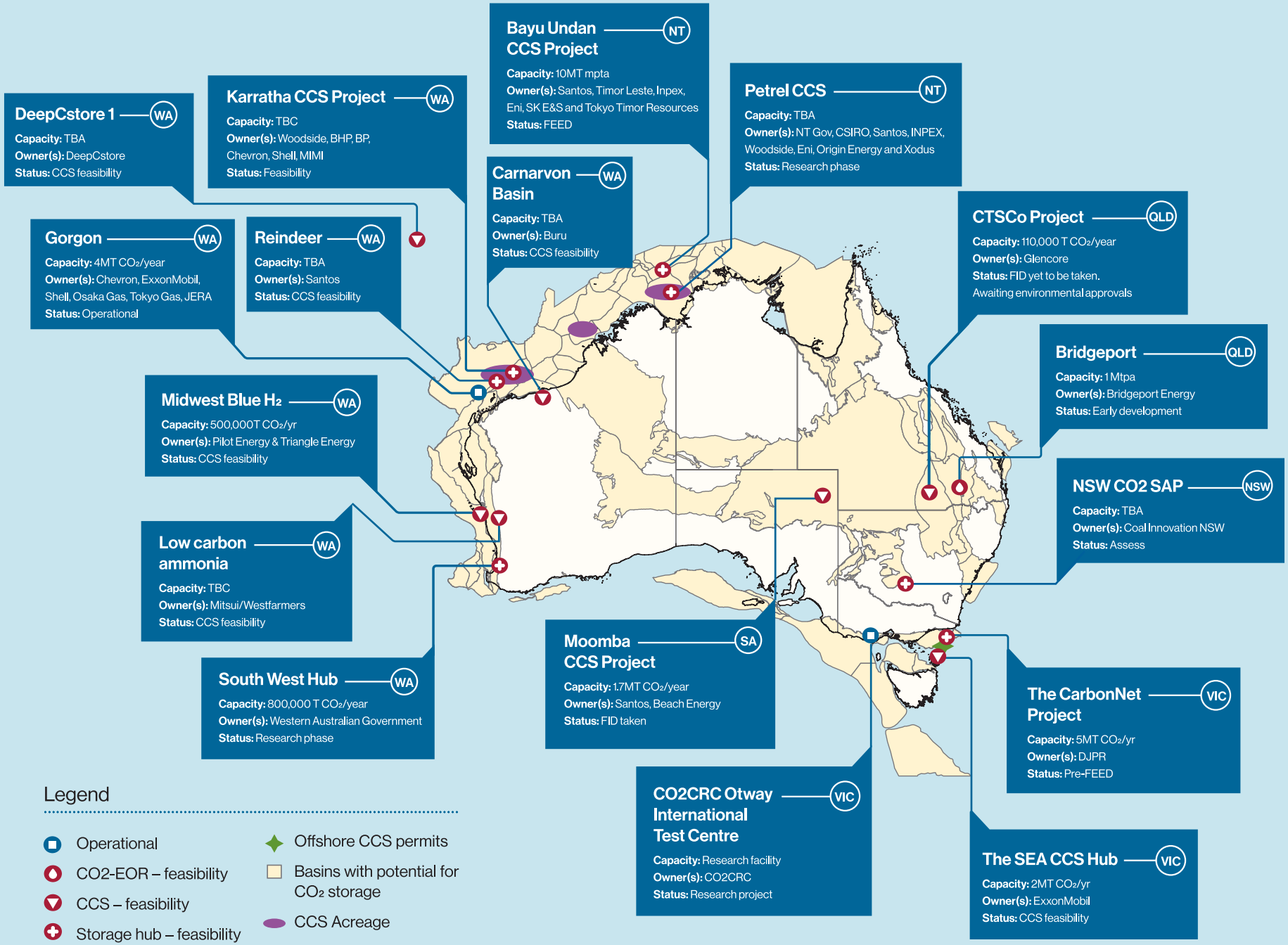
status of CCS and CCSUS in Australia

The GHG storage industry in Australia is moving rapidly from a long, slow-moving R&D-focussed period to a rapidly moving, project-centric roll-out phase

Many projects will be based around the recently awarded GHG storage acreage offshore, with another round (perhaps 10-15 areas?) of GHG exploration acreage to be gazetted within the next ~6-9 months; more could follow

These new projects will be of variable size, but uniquely, many of the larger projects, especially those based around the new GHG acreage, will be “new builds” and will have project roll-outs/builds focussed over the next 3-8 years

CCUS Projects in Australia 2022



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Why Can the GHG Regulations be a Maze?

The GHG Storage Act ("the Law") was basically written in 2005 and released in 2006 (GHG Regulations in 2011)

GHG storage is moving from the R&D (which has a low regulatory impact) to the major roll-out phase for multiple projects, wherein both the Australian GHG regulatory system and its regulators are going to be stress-tested within a charged political and social environment

The GHG approvals process will be new to the regulators (unlike petroleum) and they will be nervous and unduly cautious; the GHG approvals process is also new to the industry

- In that environment, do not assume – be certain (know) and never surprise the regulators

Our science has advanced massively since 2005 – but unfortunately the Act hasn't…. so there is a potential disconnect between regulatory expectations and the industry's technical capabilities, which will require a high level of communication between the interested parties

The Steps in the GHG Process

There are effectively six steps in the GHG permitting process

The process can be “joined” at Step 1 (make a *GHG Acreage Nomination*) and/or at Step 2 (bid for a *GHG Assessment Permit*)

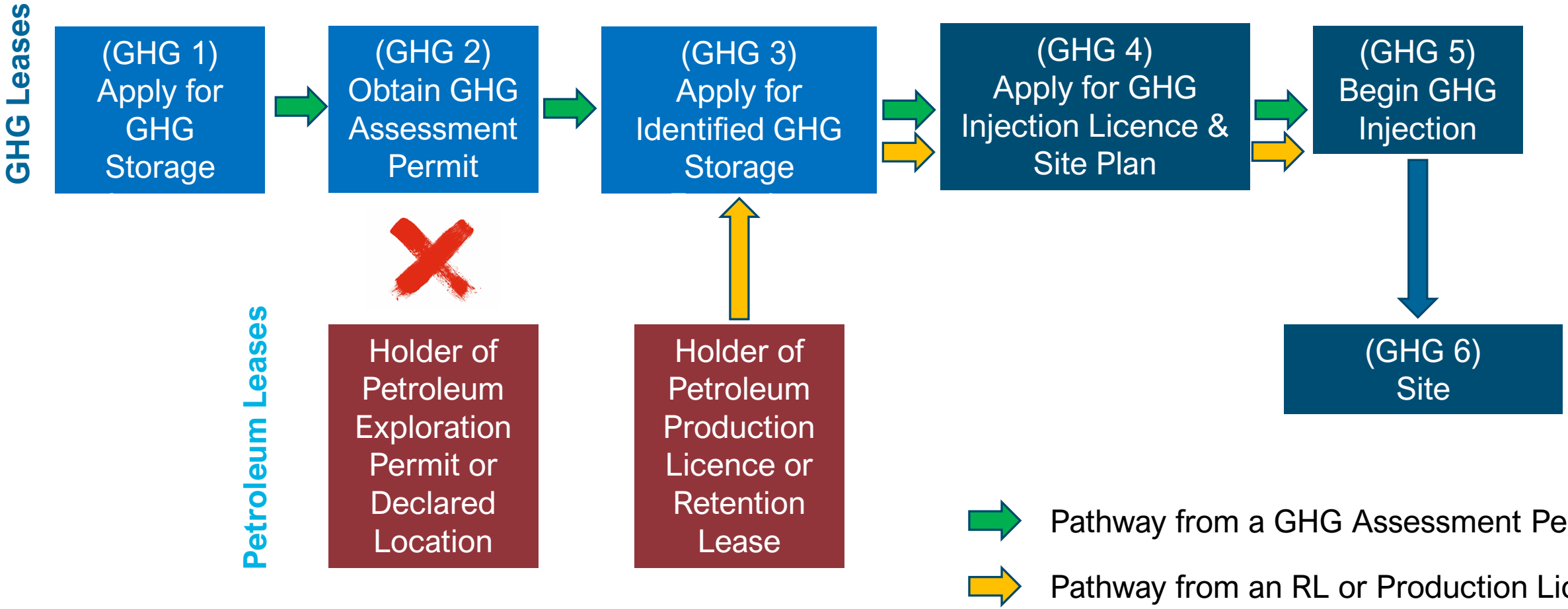
All GHG “roads” on the Pathway to Storage go through Step 3, the application for an *Identified GHG Storage Formation*

- This can be done from either a *GHG Assessment Permit* OR from a *Petroleum Production Licence* or *Petroleum Retention Lease*

After the *Identified GHG Storage Formation* is granted, application can be made for a *GHG Injection Licence* (Step 4) with the attendant submission of a *GHG Site Plan* (Step 5)

Site decommissioning/abandonment is the last step in the GHG process (Step 6)

GHG Regulatory Steps and Pathways



Steps 1 & 2 on the Pathway to Storage

1. **Apply for a Greenhouse Gas (GHG) Acreage release**
   - Acreage nominations are opened at least once a year (last round closed on July 31st, 2022)
2. **Once the GHG acreage is gazetted, apply for a GHG Assessment Permit**
   - This is a work program-based bid
   - It is likely that the GHG acreage will be gazetted between 6-9 months (perhaps 12 months) after the GHG acreage nominations closed, although this timeframe could and should be shortened
   - Obtaining a GHG Assessment Permit is the best and "cleanest" option on the Pathway to Storage
     - Far superior to apply directly for an Identified Storage Formation from a Petroleum Production Licence

Step 3: What is an Identified GHG Storage Formation?

An Identified GHG Storage Formation is the first step on the Pathway to Storage that requires a formal regulatory application and approval process – from within either a GHG Assessment Permit or from a Petroleum Production Licence or Retention Lease

It is somewhat similar to the Declaration of a Petroleum Location, but only in a conceptual sense. In reality, it is more like a hybrid of the applications for a Petroleum Location, a Retention Licence and a Production Licence/Field Development Plan

An Identified Storage Formation is *NOT a geological formation per se*. It is more like a petroleum pool, wherein it is the presence of hydrocarbons themselves that transform a porous sand sequence into a petroleum *pool*. In the case of an Identified GHG Storage Formation, it is similarly the presence of injected CO_2 (a CO_2 plume) that in effect defines the extent of an Identified GHG Storage Formation

As such, an Identified GHG Storage Formation can cross geological "formation" boundaries, just as a petroleum pool can

What does an Identified GHG Storage Formation Application Look Like?

Probably about 25-30 pages, more like a Petroleum Retention Lease application than an FDP

The results of the CO_2 injection modelling is the most important component of the application (80%)

Petroleum production data and history are also very relevant

Must demonstrate that the full range of probabilistic outcomes are considered (for all outcomes with a greater than 10% probability); probably report on P_{10}, P_{50} and P_{90} modelling results

A “break the bank” deterministic model is probably a good idea; how far is the system from failure and how bad does it all have to be for a really bad outcome?

There must be significant elements of the GHG storage development plan (that is the GHG injection licence and site plan) in this application (>50%); the injection and site plan applications cannot vary dramatically from that which is approved in the Identified GHG Storage Formation

NOPTA has a Guideline on its web-site for Identified GHG Storage Applications, which is very comprehensive

What are the Key Details for an Identified GHG Storage Formation Application?

- How much CO_2 will be injected, at what rate, for how long and where?
- How far will the CO_2 plume migrate after various time periods?
- The CO_2 must not migrate out of the Identified GHG Storage Formation, either laterally or vertically *and it cannot leave the boundaries of the Identified GHG Storage Formation (as such, the extent of the ISFm is your potential GHG permit)*
- Containment (faults, fault seal integrity, top seal integrity, rock strength, plume migration, wells as leakage points etc really needs to be well understood and constrained): what is the effective sealing feature, attribute or mechanism that enables the GHG storage to be *permanent*?
- What are the potential *Impacts* (on petroleum, other resources etc)?

Step 5: Apply for a *Greenhouse Gas Injection and Storage Lease* and submit a *GHG Site Plan*

After an Identified GHG Storage Formation has been granted (within a GHG Assessment Permit or a petroleum production licence), the lease holder may apply for a GHG Injection Licence and submit a GHG Site Plan (or apply for a GHG Holding Lease)

The requirements for these two documents are outlined in the Act and in the Regulations, but at this stage, there are no Guidelines available on either

DISR is working on the Guidelines and I have been informed that they should both be out “in the relatively near-future”

Without this documentation, it is difficult to state anything that is too definitive on Injection Licences or Site Plans (unlike the Identified GHG Storage Formation example)

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The pathway from a GHG assessment permit to an injection licence and site plan is "cleaner" than the one from a production licence to an injection licence and site plan:

- With large former production licences, this is not such as issue (cross-boundary migration; easier to expand or vary the I.S.Fm etc)
- There are issues relating to the sources of the CO_2 in former production licences

There is a lack of definition in the Act and Regulations as to what things mean. For example:

- *Engineering enhancements* are not defined anywhere (and the regulators do not know)
- The exact meaning of "*greater than 10% probability*" is not defined anywhere (and the regulators do not know)

The Identified Storage Formation development plan has to be reflected to a high level in the Injection Licence and Site Plan applications, but these will have not been written yet and may not be written for several years (subsequent to the I.S.Fm application; analogy is requiring that the contents of an application for a Declaration of Location would need to have all of the development details consistent with the submitted FDP

All of this is, cumulatively, (probably) driving the regulators down a very conservative pathway

The lack of an approved set of Guidelines from DISR-NOPTA on both GHG Injection Licences and GHG Site Plans is a concern

- What does your monitoring plan look like with no Guidelines, now and into the future?
- Basically, until these are available, the any applications for either Injection Licences or Site Plans are stalled

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CO2Tech's Opinion

Start at the end - with what needs to be approved - and then work backwards from there to the present day

- Look closely at what are the regulatory requirements are – that is, exactly what technical boxes need to be ticked – and focus on them almost exclusively; *that is what becomes your technical work program*
- This must be from the very start of the project

There is a lot of interesting technical work that could be done on (on containment etc.,), but remember that this is not a petroleum project; focus on ticking the GHG regulatory boxes and use your petroleum data (e.g. fault seal, charge history data etc) to assist in the box-ticking; use them surrogates for some of the GHG behaviours to be tested

Look at your company's long-term development plans and, where possible, avoid strategies which might constrain your future activities significantly

- Bigger is better, "wider and deeper" is a good strategy for GHG acreage
- Having control of the GHG acreage surrounding your production licence etc is a potentially good strategy

Engage with the regulators early, before you even start, and keep them informed; it will save a lot of time in the end (*no surprises*)

Collectively, there needs to be a continuous education process wherein the regulators and crafters of future legislation are helped to truly understand what the technical state-of-play is and likely to be for existing and future GHG projects; this will help to avoid a future repeat of where collectively we are now

Context for GHG Storage Regulations in Australia

Is the shortest distance between two points a straight line?

- Generally, Yes – but perhaps not if it is through a maze

Before you jump into your project, develop a sound overview of where you are now and where you are heading, when and how

Fully understand what the exit looks like

The Pathway to Storage

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