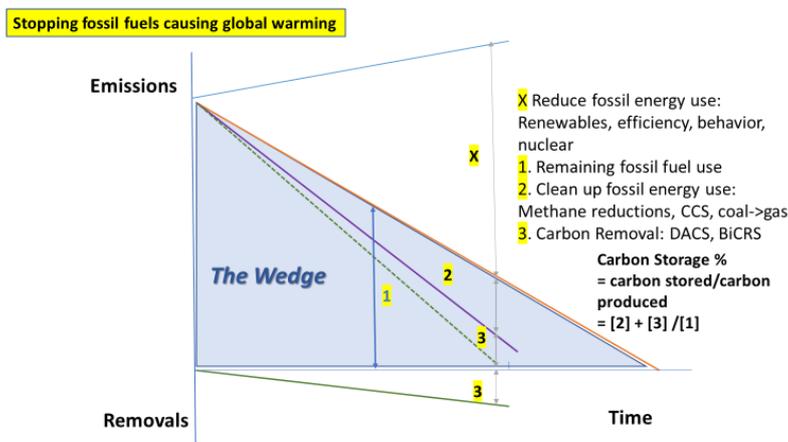


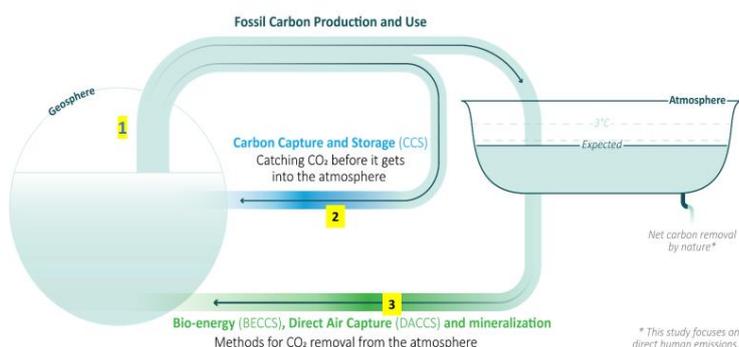
PUTTING THE BRAKES ON FOSSIL FUELS

1. Starting Point: The Wedge is highly likely to be larger than the Carbon Budget

As emissions continue to rise and the remaining carbon budget quickly shrinks it is clear that additional policies are urgently needed to speed up the transition and reduce emissions. The first priority [X] is to reduce fossil fuel use rapidly by increasing energy efficiency, changing behaviours and scaling up renewable energy use. **But there is a limit to how fast this can be done.** The remaining energy demand will continue to be supplied by fossil fuels. The result is a **wedge of fossil carbon emissions** that is by now highly likely to be **much larger than a ‘Paris-compliant’ carbon budget**. Therefore, most scenarios also include point-source CCS (Carbon Capture and Storage) [2] and CDR (Carbon Dioxide Removal) [3] to reach Net Zero in a certain year. Still, the carbon budget is likely to be exceeded, and therefore continued CDR is required to deliver net negative emissions thereafter.



2. Introducing Geological Net Zero



Many people are by now familiar with the term Net Zero as used for greenhouse gas emissions. In the aspired NZ year any remaining emissions are balanced by removals from the atmosphere [3]. But we can also look at this from the perspective of carbon stored in the geosphere: **Geological Net Zero (GNZ)** is reached when **carbon produced** [1] is balanced by **carbon stored** [2 + 3] in the geosphere. Progress towards GNZ is tracked by reporting fossil carbon production and permanent storage. When GNZ is reached fossil fuels are no longer causing global warming.

3. Supply-side policy to reach GNZ: Carbon Takeback Obligation (CTBO)

A fundamental problem is that it is highly uncertain how much CCS and CDR will be needed. Scenarios vary wildly from only a few Gt/y to 10 to 20 Gt/y by mid century. **Setting absolute targets for carbon storage is therefore not recommended.** Too high a target would create unnecessary fossil fuel lock-in, and too low a target would risk not getting to GNZ on time. The proposed CTBO policy therefore assumes **relative targets** (stored fraction or storage percentage): more production means more has to be stored and vice versa. The obligation is placed as high up in the value

CTBO: core elements

- Storage Obligation:** an obligation to permanently store carbon for producers/suppliers of fossil carbon products;
- Stored Fraction:** carbon stored divided by carbon produced scaling up in line with requirements in Net Zero scenario's:
2030: 10% 2040: 50% 2050: 100%
- Carbon Storage Unit (CSU):**
a CSU is awarded for each verified unit of carbon permanently stored
They can only be used to demonstrate compliance with CTBO!
- Carbon Storage Surcharge (CSS)**
Producers include (some of) the additional cost for CTBO compliance in product price

chain as possible (in a country), preferably on the producer of fossil fuels. There are many different ways in which this can be organised (from a government owned transport and storage infrastructure to regulated private market projects) but the principle remains the same: to produce and sell fossil carbon you need to show evidence of enough permanent storage by handing over Carbon Storage Certificates. See for more details recent reports from the Netherlands. ¹

4. **Fossil Fuels Phase-Out Strategy: how can a CTBO help?**

The challenge with all ambitious policies is how to get them implemented globally? Or at least get large producers and users to adopt the policy? It is logical for countries and regions that have plans for CCS and

Phasing out by scaling up

1. **Leading countries** introduce CTBO-policy; eg North Sea countries, EU, North America, Net Zero Producers Forum
2. Countries include CTBO-requirements for **import** and **export** agreements
3. Worldwide CTBO policies and increasing storage % **put the brakes on fossil fuel production and use**
4. **Geological Net Zero** is achieved; some fossil fuels are still being used
5. Further **increase above 100%** can be considered (removal of historical emissions and overshoot)
6. Fossil energy **phase-out is achieved**

the storage percentage above 100 in order to speed up phasing out of remaining fossil fuel use and to realize net negative emissions at the same time.

CDR to lead the way. Compliance with a CTBO becomes a condition for access (selling fossil fuels) on these markets. At low storage percentages the additional cost for customers is low so that should be possible. Scaling up is done by countries and companies **restricting imports and exports** to be only from/to countries that also have implemented CTBO regulations. In that way a **country** (like Norway e.g.) can also **share in the responsibility** for cleaning up the emissions caused by the products they export. After GNZ is achieved countries can choose to further increase

5. **How to combine FF-NPT (fossil fuel non-proliferation treaty) and CTBO to maximise impact?**

Although the main driver of a CTBO policy is for timely (net) emission reduction (climate policy) it is essential to recognise that **all ambitious climate policies are in fact also energy policies**. For most countries energy security and affordability are high priorities (and ignored at one's peril) and many countries will not accept outside interference that could jeopardize these issues. That's why it has been extremely difficult to get any mention of phase-out of (even unabated) production in treaties and COP-outcomes. The CTBO circumvents that problem by allowing energy decisions to be made nationally but to require countries to commit to GNZ to be allowed to continue to import and export (and use) fossil fuels. This means that **countries have a choice**: they can commit to **phasing out production and use** (many countries are making that choice for coal production and use) or they can **commit to implement a CTBO**; both strategies can get them to GNZ on time and both should be available under a FF-NPT. Different choices can be made for coal, oil, gas and cement by different countries. Many countries do not know how long they will still need fossil fuels. Countries that place a high value on their energy autonomy are more likely to join if they can choose how to get to GNZ. Over time, countries can add 'closing down' commitments to their 'cleaning up' commitments. **The only option that should no longer be available is doing nothing.**

Mandatory Fossil Carbon Management Plans

Clean up?

Or

Close down?

- ✓ Commit to Geological Net Zero
- ✓ Develop a Fossil Carbon Management Plan
- ✓ For each fossil carbon (coal, oil, gas, cement) choose how to get to GNZ
 - ✓ Close down: how/when to end production & consumption
 - ✓ Clean up: how to make sure any remaining use is Geological Net Zero on time; eg by implementing a CTBO policy
- ✓ Include targets in NDC's and report progress towards GNZ

This 2-pager is a summary of a longer exploratory paper that can be found here:

<https://carbontakeback.files.wordpress.com/2022/09/putting-the-brakes-on-fossil-fuels.rev2f.docx>

¹<https://www.gemeynt.nl/bericht/carbon-takeback-obligation-ctbo-is-gaining-support>