DIAMOND VAULT
A CLECO PROJECT

SCIENTIFIC TECHNOLOGY

What is the goal for Cleco's Project Diamond Vault?

Project Diamond Vault will retrofit Cleco's existing Madison 3 plant to reduce up to 95% of its carbon dioxide emissions through carbon capture and sequestration (CCS) technology.

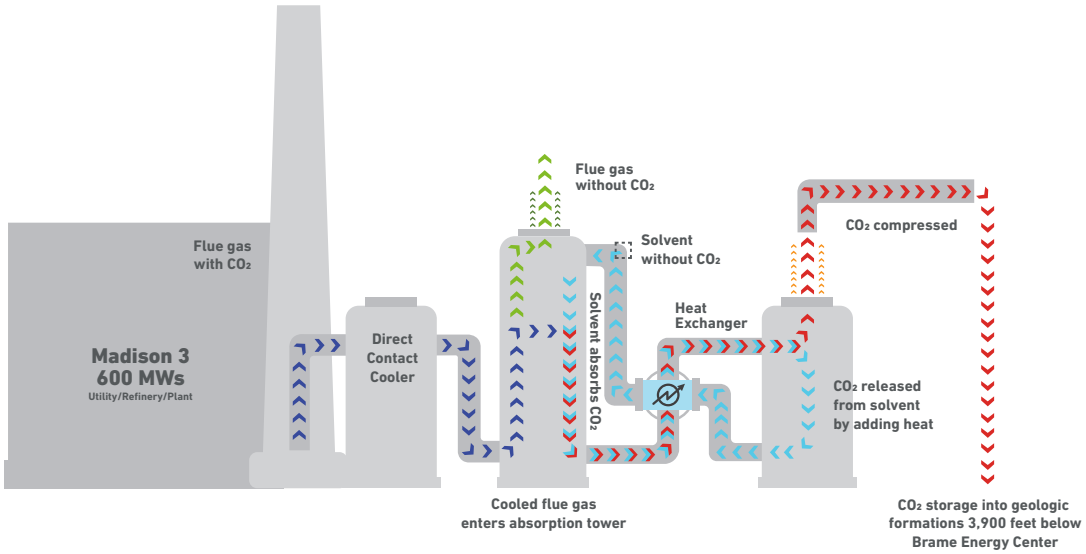
How will the CCS Technology work?

The facility will (i) use a chemical process to remove up to 95% of the CO_2 produced by the combustion of fuel in Cleco's Madison 3 electric generation unit, (ii) compress the CO_2 and (iii) store it in deep geological formations located directly beneath Cleco's Brame Energy Center site.

Why Carbon Capture?

Even the most ambitious emission-reduction scenarios maintain a share of fossil fuel usage, suggesting carbon capture solutions are needed to achieve full decarbonization.

Findings from Princeton University's Net-Zero America* study conclude that significant carbon capture will be required for achieving net zero emissions of greenhouse gasses by 2050 and require geological carbon sequestration.



Steps/Process

1. We are taking the flue gas from the existing Madison 3 Unit and retrofitting the unit so that the flue gas runs through a carbon capture system.
2. Once the flue gas leaves Madison 3, it is cooled before it enters an absorber tower. In the absorber, the flue gas will contact an amine-based solvent whereby through a chemical process, the amine will capture and remove the CO_2 from flue gas.
3. The flue gas will be released via the absorber stack minus the CO_2.
4. After the CO_2 amine solvent leaves the absorber, it will be heated to allow the CO_2 to separate from the amine solution where it will then be compressed, dehydrated and injected below ground.

KEY

BLUE arrows represent the flue gas with CO_2.

RED represents the CO_2 being taken from the flue gas.

LIGHT BLUE represents the amine solvent that's absorbing the CO_2.

NEXT, the **LIGHT BLUE** and **RED** together (amine that has captured the CO_2), represents the CO_2 and amine solvent together going through a heat exchanger. The amine solvent is reused and returned to the absorber while the CO_2 is compressed, dehydrated and injected into the ground (sequestration).

GREEN represents the flue gas going out of the stack minus the CO_2.

*Princeton Net-Zero America netzeroamerica.princeton.edu

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GLOSSARY

Definitions:

- **Absorber** Chemical absorption involves the reaction of CO_2 with a chemical solvent to form a weakly-bonded intermediate compound which may be regenerated with the application of heat producing the original solvent and a CO_2 stream.

- **Amine Solvent** Amine PCC uses an amine-absorption process to capture and separate CO_2 from a flue gas stream. Amines are derivatives of ammonia and are water-soluble organic chemicals that contain reactive nitrogen atoms and can rapidly, selectively and reversibly react with CO_2.

  Amines have been used in carbon capture extensively and studied for more than 20 years. They have also been utilized on a commercial scale for many years to capture CO_2 from a variety of sources and for decades in other applications. Currently, amine-based CO_2 capture is the most industrially developed and widely-used method applied to the PCC method.

- **Flue Gas** is the gas exiting to the unit via a flue, which is a pipe for conveying exhaust gases from the generation stack. The flue gas refers to the combustion exhaust gas, including CO_2, produced by Madison 3.

- **Post Combustion Capture (PCC)** Pre-combustion carbon capture allows the removal of CO_2 from a gas mixture before combustion takes place. Operators typically apply this carbon capture in integrated gasification combined cycle (IGCC) power plants.

  The working principle includes partially oxidizing coal in oxygen/air and steam under high temperature and pressure to produce synthetic gas (or syngas). Being a mixture of carbon monoxide (CO), carbon dioxide (CO_2), hydrogen and smaller portions of other gaseous components, such as methane (CH_4), syngas can undergo the water-gas shift reaction to produce a gaseous mixture significantly comprising H_2 and CO_2. Operators capture, transport and sequester the CO_2 in the mix, leaving an H_2-rich fuel for combustion.