

CO2 CAPTURE

This EEG LLC technology makes use of the several technologies (commercial compander, or EEG LLC T-CAES system or [mainly] the EEG LLC TL-CAES system) to provide a high mass flow of super chilled air (-175°F) to coal fired power plants to remove the carbon dioxide (CO₂) from the exhaust flue gases.

This will be the first step to creating high pressure liquid CO₂ to replace high pressure toxic-laden water for fracking and or to creating solid blocks of CO₂ to insert into abandoned oil wells to decrease the remaining oil that is amenable to mixing with CO₂ to allow pumping to start again.

The ease of removing the CO₂ from the flue gas assumes that the **integrated gasification combined cycle (IGCC)** is the technology being used by the coal fired power plant.

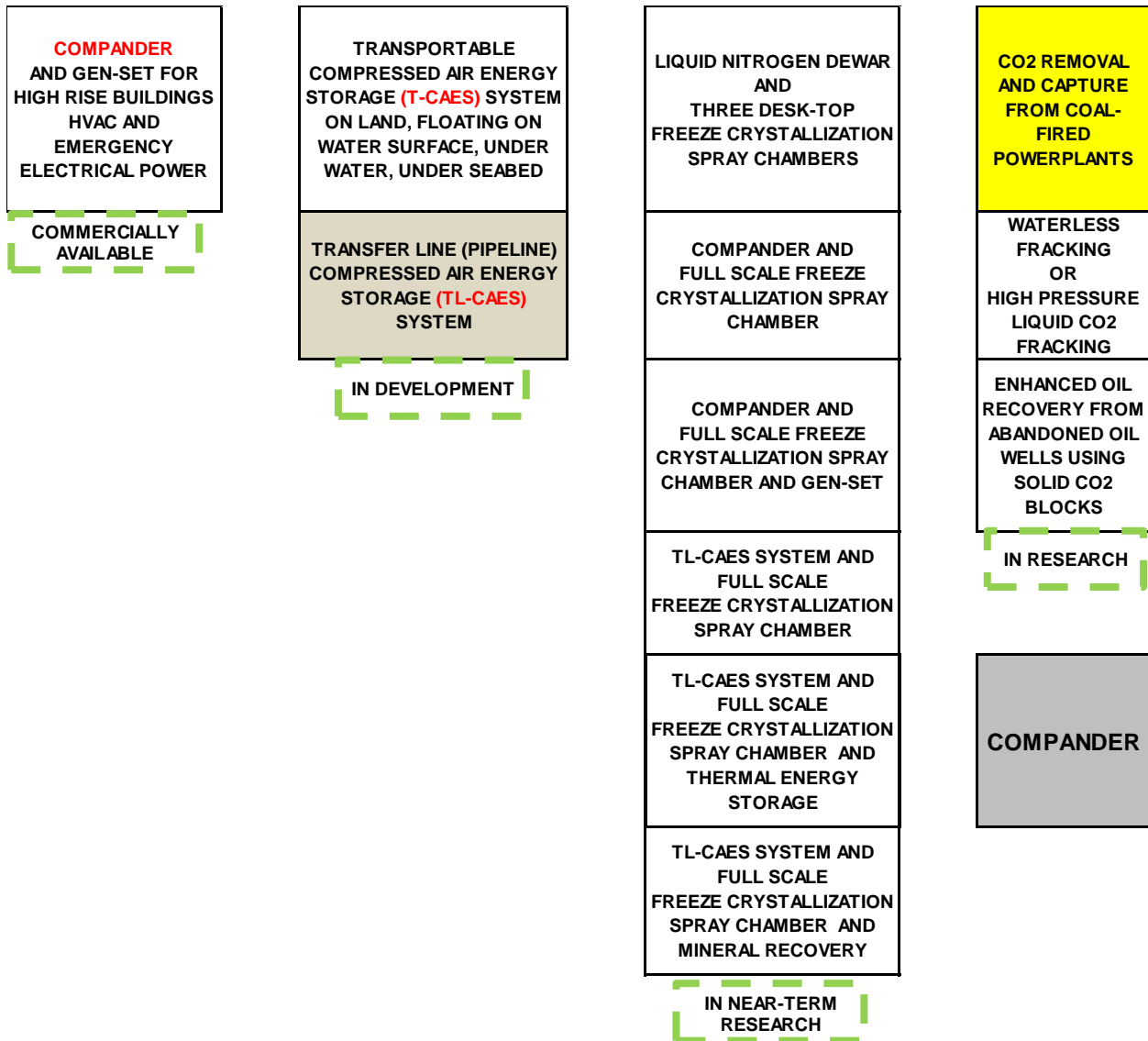
This is the process that is expected to be used in the future because this process results in improved thermodynamic efficiency compared to conventional pulverized coal combustion. Furthermore, this gasification process can produce syngas from a wide variety of carbon-containing feedstocks, such as high-sulfur coal, heavy petroleum residues and **biomass**.

Also the IGCC technology is the first step in creating both CO₂ and hydrogen (H₂). It is the H₂ that will drive the Integrated Gasification Fuel Cell Cycle that will generate electricity and water vapor. This represents the future clean technology.

IGCC is now touted as capture ready and potentially can be used to capture and store carbon dioxide. The USA now has several such IGCC plants. Although the intent is to eventually use this process for Carbon Capture & Storage (CCS). Our intent is to capture the carbon dioxide, liquefy and pressurize the carbon dioxide to replace high pressure water in fracking and just freeze the CO₂ to form dry ice blocks for mixing with viscous oil in abandoned oil wells to activate the wells again.

Poland's Kędzierzyn Zero-Emission Power & Chemical Plant combines coal gasification technology with Carbon Capture & Storage (CCS). This installation had been planned, but there has been no information about it since 2009. Other operating IGCC plants in existence around the world are the Alexander (formerly Buggenum) in the Netherlands, Puertollano in Spain, and JGC in Japan.

The high cost of IGCC is the biggest obstacle to its integration in the power market; however, most energy executives recognize that carbon regulation is coming soon.



In summary, we will use IGCC power plant, that is essentially a high pressure gasifier to turn coal and other carbon based fuels into pressurized gas—synthesis gas (syngas). This simplifies our task of dealing with a complicated mixture of flue gases because we are only dealing with CO₂ and H₂. We use our high mass flow of super chilled air from our patented EEG LLC TL-CAES system to produce high pressure liquid CO₂ to replace high pressure toxic-laden water for fracking and or to creating solid blocks of CO₂ to insert into abandoned oil wells to decrease the remaining oil that is amenable to mixing with CO₂ to allow pumping to start again.

SEE PATENT TITLE ON LIST OF PATENT NUMBERS	APPLICATION	STAGE OF DEVELOPMENT	INITIAL INVESTMENT	TIME SCALE	NUMBER OF SITES	MAGNITUDE OF RETURN PER SITE
12	COMPANDER AND GEN-SET FOR HIGH RISE BUILDINGS HVAC AND EMERGENCY ELECTRICAL POWER	EACH COMPONENT IS AVAILABLE OFF-THE SHELF EXCEPT FOR CENTRIFUGE DOUBLE-ELBOW-DUCT	VERY SMALL	PRESENT	VERY LARGE	EXTREMELY LARGE
1, 3, 4, 11, 13, 16, 17	TRANSPORTABLE COMPRESSED AIR ENERGY STORAGE (T-CAES) SYSTEM ON LAND, FLOATING ON WATER SURFACE, UNDER WATER, UNDER SEABED	EACH COMPONENT IS AVAILABLE OFF-THE SHELF	MEDIUM	PRESENT	LARGE	MEDIUM
2	TRANSFER LINE (PIPELINE) COMPRESSED AIR ENERGY STORAGE (TL-CAES) SYSTEM	EACH COMPONENT IS AVAILABLE OFF-THE SHELF	LARGE	PRESENT	MEDIUM	MEDIUM
18	LIQUID NITROGEN DEWAR AND THREE DESK-TOP FREEZE CRYSTALLIZATION SPRAY CHAMBERS	SIMPLE SOLUTES (HIGH CERTAINTY) COMPLEX SOLUTES (LESS CERTAIN) TOXIC SOLUTES (LEGAL ISSUES)	SMALL	MONTHS	MEDIUM	LARGE
18	COMPANDER AND FULL SCALE FREEZE CRYSTALLIZATION SPRAY CHAMBER	ISOLATION PERFORMANCE DEPENDENT ON 3 DESK-TOP CHAMBER TESTS	VERY SMALL	MONTHS	ONE	EXTREMELY LARGE
6, 7	TL-CAES SYSTEM AND FULL SCALE FREEZE CRYSTALLIZATION SPRAY CHAMBER	VALIDATE SEPARATION EFFICIENCY OF WASTEWATER DROPLETS OVER SHORT RESIDENCE TIME AND WITH EXTREME TEMPERATURE DIFFERENCES	LARGE	MONTHS	ONE	EXTREMELY LARGE
5, 7	TL-CAES SYSTEM AND FULL SCALE FREEZE CRYSTALLIZATION SPRAY CHAMBER AND THERMAL ENERGY STORAGE	SITE WHERE THERMAL ENERGY STORAGE WATER TANKS ALREADY IN USE	LARGE	MONTHS	VERY LARGE	MEDIUM
8	TL-CAES SYSTEM AND FULL SCALE FREEZE CRYSTALLIZATION SPRAY CHAMBER AND MINERAL RECOVERY	VALIDATE SEPARATION EFFICIENCY OF BULK WASTEWATER OVER SHORT RESIDENCE TIME AND WITH EXTREME TEMPERATURE DIFFERENCES	VERY LARGE	SEVERAL YEARS	LARGE	LARGE
9	CO2 REMOVAL AND CAPTURE FROM COAL-FIRED POWERPLANTS	CURRENT TECHNOLOGY OF HEAT EXCHANGERS	LARGE	MONTHS	MEDIUM	LARGE
10, 14	WATERLESS FRACKING OR HIGH PRESSURE LIQUID CO2 FRACKING	EXTEND SHALE/COAL STRATA LABORATORY DATA TO FIELD	VERY VERY LARGE	MANY YEARS	VERY LARGE	EXTREMELY LARGE
15	ENHANCED OIL RECOVERY FROM ABANDONED OIL WELLS USING SOLID CO2 BLOCKS	EXTEND LABORATORY DATA TO FIELD	VERY VERY LARGE	MANY MANY YEARS	MEDIUM	SMALL

9. Method and Apparatus for Removing Carbon Dioxide from Coal Combustion Power Plants

CO2 REMOVAL FROM COAL-FIRED POWER PLANTS

US 2009/0205364 A1

January 23, 2009

Australia 2009206700

January 23, 2009

South Africa 2010/05995

January 23, 2010

10. Method and Apparatus for Sequestering CO2 Gas and Releasing Natural Gas from Coal and Gas Shale Formations

PRESSURIZED LIQUID CO2 FOR GAS/OIL RECOVERY FROM SHALE/COAL

U.S. 8,839,875

December 28, 2010

14. Method and Apparatus for Using Pressure Cycling and Cold Liquid CO2 for Releasing Natural Gas from Coal and Shale Formations

PRESSURIZED LIQUID CO2 FOR GAS/OIL RECOVERY FROM SHALE/COAL

US 8,833,474

May 2, 2012

US 9,453,399 B2

September 27, 2016

15. Method and Apparatus for Using Frozen Carbon Dioxide Blocks or Cylinders to Recover Oil from Abandoned Oil Wells

NON-PRESSURIZED SOLID CO2 FOR ABANDONED OILWELLS AND OIL RECOVERY

US 2015/026002

March 27, 2015

COLOR CODE

PATENT

PATENT IN REVIVAL PROCESS