November 09, 2020

CPCE process for sustainable clean fossil energy with net Zero-CO_2 and Zero-pollution

EVISA Engineering has developed a patented technological solution to the global warming and owns one of the three commercially viable solutions, yet the only technology that is capable to resolve the climate change with significant profit, i.e. lowering the costs for the power generation, or manufacturing of high value Green Products for economy and military e.g. gasoline, military jet fuels and others or a combination thereof to ca. 30% compared with today's costs [1, 2].

In this process, EVISA Engineering demonstrates the commercial-ready Carbon Power & Chemicals Economy, CPCE process for the Zero-CO_2 and Zero pollution advanced fossil energy distinguished by total carbon capture and harnessing the useless waste heat to useful carbon power utilization as well the chemical conversion of carbon dioxide to high end Green Products.

1) Technological and commercial purview of CPCE

The CPCE applications can be used in economy in general as well in military for military grade jet fuel in special. CPCE provides five group of applications [3]. Four of the CPCE applications have been specifically designed for the upgrading of the existing fleet of existing fossil energy CO_2 emitting plants -both pre-combustion as well post-combustion CO_2 emitting- in order to turn them to zero-CO_2 and zero-pollution plants, while producing various Green Products.

The fleet of these post-combustion CO_2 emitting operational plants are culprit for nearly 75% of the global CO_2 emission today. Yet, the upgrading of these plants can resolve the global warming and lead to the highest profit of the Green Products, because these products are manufactured with the zero-Dollar-value carbon dioxide and waste heat. The other byproduct, the pure oxygen from CPCE, positions a nearly zero-Dollar costs, because the economic profit balance is overruled by the syngas with ca. 30% lower costs than other commercial syngas processes. For this, the two post-combustion carbon applications of the CPCE enable the shortest return of investment in 1.2 to 1.5 years only, depending on the size of the plant and if high rank coal is utilized as the primary fossil fuel. With respect to nearly 4000 post-combustion carbon plants in the United States alone, the revenue from upgraded plants for the manufacturing of Green Products over syngas $CO/2H_2$ encompass trillions of Dollars just in the next ten years, yet then in the United States alone.

The two post-combustion carbon capture and utilization applications (for instance installed in an existing coal power plant) are capable to reverse the global warming within ten years, yet to resolve the climate change in ca. 20 years. These two applications with the highest revenue comprise the following five sections according to the enclosed chart:

I. Advanced Combustion (also referred to Flue Gas Recirculation/Oxyfueling) that encompasses the preparation high concentrated CO_2 containing flue gas "CO2-Stream" of ca. 92 Vol CO_2% with ca. 8 Vol% oxygen, i.e. no intake air for combustion, ergo no nitrogen in the flue gas, yet the flue gas upstream to further processing is obtained at only 27% of the original flue gas flow rate, all benefiting the overall process profit [6].

9710 Traville Gateway Drive, Suite 251 Phone 240-426-9474
Rockville, Maryland 20850 Email FBairamijamal@EVISA-Engineering.com
U.S.A Web EVISA-Engineering.com www.ZeroCO2FossilEnergy.org

II. Flue gas compression, whereas 85% of the CO2-Stream undergoes the processing for cooling, condensation, separation of liquid CO2 over electrolysis to the syngas while,

III. 15% of the CO2-Stream is deployed to Dry Reforming section for additional syngas generation at high temperature

IV. High pressure electrolyte of liquid carbon dioxide and water for high pressure low temperature electrochemical syngas generation HPLTE-SG on the cathode and oxygen from the anode for the Advanced Combustion above, whereas both high pressure product streams of HPLTE-SG are employed four times for power generation for the new "closing trajectory" of the first new thermodynamic cycle v.i.

V. Process in situ performance of the brunt of power needed for the CPCE overall process, i.e. both for the driving the flue gas compressor, as well as DC back up power supply for the electrolysis are harnessed from the waste heat recovery through the operation of the First Bairamijamal Thermodynamic Cycle with the super critical CO_2 as working fluid

With the consideration of the waste heat to the extent of nearly 45% in the currently operational thermal power plants, the CPCE recovers the currently vast useless waste heat to useful energy via the First Bairamijamal Thermodynamic Cycle through the super critical carbon dioxide, yet distinguished in its new "closing trajectory" [4]. The CPCE's new way for waste heat recovery hallmarks a quantum leap in terms of overall efficiency in the fossil energy power generation in general and backs up specially the necessary power for the overall CPCE processing as well as provides almost part of the direct current electricity supply for the high pressure electrolysis. The key process steps related thereto, are presented [5]. This milestone in the super critical carbon dioxide cycle could not have been surpassed since February 2013 yet, although still some companies and agencies keep trying to utilize super critical carbon dioxide cycle with inferior "techniques" for commercial use (for instance the GE, GTI, NETL and DOE multi million Dollars funded ongoing attempt with the STEP DEMO 10 MW project commenced in 2018, yet then with the technologically obsolete concept, however). The STEP DEMO project does perform waste heat recovery to very little portion like other attempts undertaken in the past [11].

The fifth CPCE application leads to a new generation of fossil energy power plants for near future. In this latter application, referred to as the super-efficient hydrogen-based fossil power plants, a new generation of fossil energy plant can be installed via high pressure gasification and fed with CPCE's oxygen together with coal, or any other carbonaceous feedstock achieving a gross thermal efficiency of above 90% while factually zero carbon dioxide and zero pollutions takes place. These plants will emit no carbon dioxide, no waste heat is dilapidated through the cooling towers, while all adverse pollutants of the coal can be removed as an virtuous insoluble non-leachable slag at high concentration subject to depository e.g. in old coal mines or depleted oil wells securely.

2) Fields of the CPCE, time frame to resolve Global Warming, the revenue, and ROI

The technological breakdown of CPCE for the two post-combustion carbon capture and waste heat recovery in the upgrading of an existing 500 MW coal power plant to high value Green Products to gasoline, demonstrates a revenue of billion BB$1.2 a year, with an estimated investment of MM$850.- resulting in an ROI for nine months post the commencement commercial operation only, vide detail in EBIT of coal-to-gasoline in [7]. Considering the fleet of nearly 4000 CO_2 and waste heat emitting operational commercial plants in the United States alone, these two applications result to trillions of Dollars in profit within the next ten years alone. The revenue of these two applications can reach to huge number of trillions of Dollars globally. The turning point in the rising global temperature can be expected in ca. 10 years effective commencement of the first upgrading projects. Upon the pace and extent of the projects, the normalization of global temperature back to the level of 1970, can be estimated within the next 20 years. Naturally, this very fast pace will be almost driven by the economic profit due to the high revenue to the favor of benefiting companies to the order, the utility companies, coal mine, natural gas companies, the equipment suppliers, the engineering companies, and then EVISA LLC the technology provider.

The other two pre-combustion carbon capture applications to high end Green Products result to far less revenue due to the limited number of commercial plants on operation.

3) The fundamentals of CPCE

All five fields of CPCE's applications stand in one or the other way upon three fundamental technological principals. All the necessary chemical or process engineering data required for the design of the first prototype plants are already available or can be almost predicted with the software and mathematical calculation to a reasonable extent and security. All the equipment employed in the CPCE are either commercially available by number of vendors or can be readily designed due already available process engineering data. The primary focus for process optimization at the present time shall be devoted to the kind of the electrodes for the high pressure electrolysis, v.i. for HPLTE-SG units.

Like in other milestones in major chemical and power generation processes, e.g. ammonia, methanol, gas turbine from their inception to this day, the "very fine trim" of CPCE may also take hundreds of years from scientific chemistry to the detail process optimization (vide resume of inventor and the history of ammonia and methanol as the Mother Chemicals to the ongoing recent developments and patents achieved just in the present year). The fundamentals of CPCE are:

I. Capture of CO_2, concentration of CO_2, then cooling and liquefaction of CO_2

II. Recovery and generation of electric power supplying the CPCE and for dispatch via two new thermodynamic cycles, referred to as the First and Second Bairamijamal's Cycles

III. High pressure low temperature electrochemical conversion of liquid CO2 and water to the intermediate syngas $CO/2H_2$ and oxygen, which are either fed to the adjacent plants for the final Green Products or supplies the oxygen for Advanced Combustion.

In the context of CPCE for the new generation of super-efficient hydrogen based fossil power plants in future, there are two high pressure ultra-superheated Direct Steam torches designed in the CPCE's parent patent. This kind of torch is akin to the advanced hydrogen-oxygen injection in the modern jet engines (e.g. SABRE engine) or the plasma torches.

The primary field of research, required for CPCE is for the development of a test rig for the HPLTE-Syngas Generator that is fed with high pressure liquid CO_2 and water for exact evaluation, determination of currently best kind of electrode material as well the exact determination of DC current efficiency for the electrochemical conversion.

4) Actual status of CPCE patent application and patents securities

CPCE is grounded on the nearly three decades of fossil energy experience of the inventor in the process development, design, detail engineering, as well as operation and maintenance of commercial midsize and large scale fossil energy plants, both in the chemical and the power generation plants, vide resume of the inventor in [10].

CPCE has been filed for patent application first in United States with the provisional registration code of US 61/850, 685 and the priority date of February 21, 2013. Both, the parent patent as well the patents in continuation enjoy the same priority date. The international PCT application was entered to as of February 19, 2014 and can be revoked for every 148 PCT countries effective February 19, 2014. The CPCE is accepted by the United States Patent and Trademark Office as a group of five inventions, fulfills the necessary securities, e.g. novelty, unity as a patentable process without any kind of interference or infringement to other commercially or patented processes.

The national and international patent prosecution since 2013 proves the vast securities under the purview of national and international patent laws. Naturally, every infringement to the CPCE's patents will be responded nationally or internationally by inventor. The details of CPCE patents and status are collected in [2]. It is anticipated that the U.S. patent will be granted in 2021 now. By virtue of above security, the nomination of the inventor for outstanding engineering and scientific prizes (e.g. Queen Elizabeth Prize, European Union's Horizon Prize and Nobel Prize) is ongoing or will be commenced in due time.

As result of very encounters to the solutions of Climate Change in the last four years, EVISA Engineering calls out to United States National Civil Action, in order to join with the two other technologies to resolve the global warming crisis and defeat the hostile influence of the oil and gas exporting countries, oil and gas entities as well as the nuclear power generation.

Likewise, as the United States Department of Energy, Department of Commerce, Department of

Defense, EPA and other Federal agencies have not been interested in resolving the global warming since 2017, EVISA Engineering is pursuing to dispense patent shares to international companies, investors and energy entities and attract international companies in investment in the United States and elsewhere for economy as well as for military use now.

Further references to the CPCE Short Description

[1] The terms "Zero-CO_2- and Zero-pollution " refers to CPCE process that utilizes the CO_2 as a new fossil energy resource and converts the useless waste heat to useful electricity for the backup DC power supply to the CPCE's electrolysis. The breakdowns with process engineering calculations with the factually zero-Dollar value CO_2 and waste heat provides a costs reduction for the CPCE's syngas at 35% compared with steam reforming and nearly 30% compared with the syngas obtained by way of coal gasification. Under the same preconditions, the costs for the CPCE's pure oxygen as the CPCE's byproduct results to near zero-Dollar, vide [2] below.

[2] The group of CPCE patents are presented in detail for the CPCE's parent patent as well as the CPCE's Advanced Combustion patent in continuation: http://www.evisa-engineering.com/patent.html

[3] The five application of the CPCE is presented in EVISA Engineering's website in: http://evisa-engineering.com/data/cpce_data/pdf/CPCE_Block_Diagrams_August29_2019.pdf

[4] The detail description of the two new thermodynamic cycles with their peculiarities and charts are provided in: http://www.evisa-engineering.com/data/cpce_data/pdf/CPCE_Two_New_Cycles.pdf

[5] CPCE key process steps in the post-combustion and pre-combustion carbon capture, carbon utilization:
   a) http://www.evisa-engineering.com/data/cpce_data/pdf/Simplified_CPCE_Post-Combustion_Steps.pdf
   b) http://www.evisa-engineering.com/data/cpce_data/pdf/Simplified_CPCE_Pre-Combustion_Steps.pdf

[6] Abstract of CPCE's first patent in continuation, filed in USPTO on March 16, 2020 amenable in website: http://www.evisa-engineering.com/data/cpce_data/pdf/Abstract_FirstContiPatent.pdf

[7] Open Letter to United States' Secretary of Energy, Sheet for the EBIT of coal-to-gasoline: http://www.evisa-engineering.com/data/announcement/doe/US-DOE_3-Requests_July02_2020.pdf

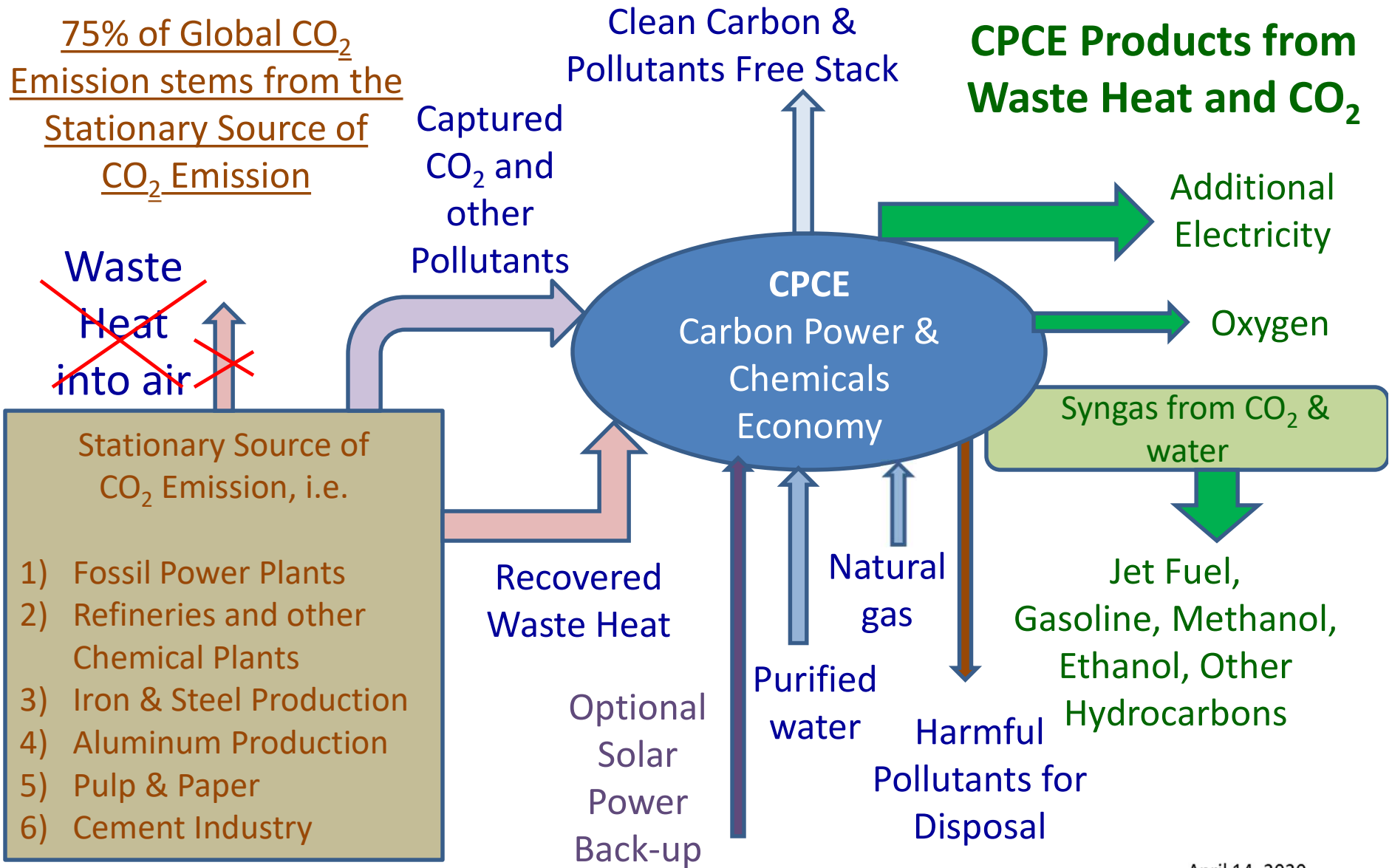
[8] A set of illustrative depictions of CPCE is amenable in EVISA Engineering website, section for Gallery: http://www.evisa-engineering.com/gallery.html

[9] Objectives and criteria of United States National Civil Action amenable via: http://www.evisa-engineering.com/data/civil-action/pdf/US_NCA_Objectives_Criteria.pdf

[10] Curriculum of inventor with nearly 30 years expertise in commercial fossil energy http://evisa-engineering.com/data/resume/Bairamijamal_Resume.pdf

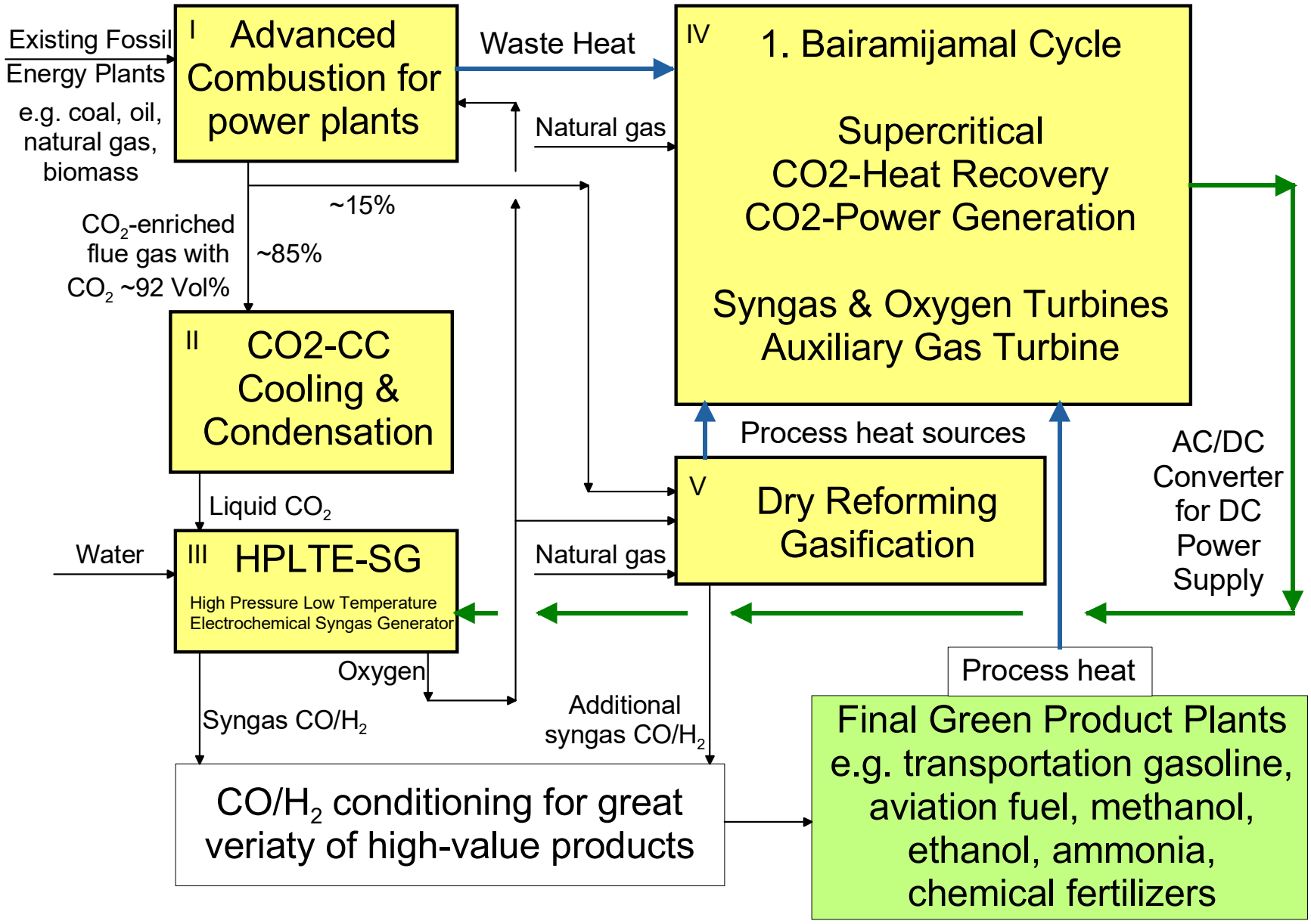
[11] STEP DEMO, Figures 2 a and 2b in project detail description amenable via: https://www.gti.energy/wp-content/uploads/2019/01/STEP-Project-Detailed-Description-Dec2018.pdf

CPCE, the Zero-Carbon-Dioxide-Emission Advanced Fossil Energy Process



April 14, 2020

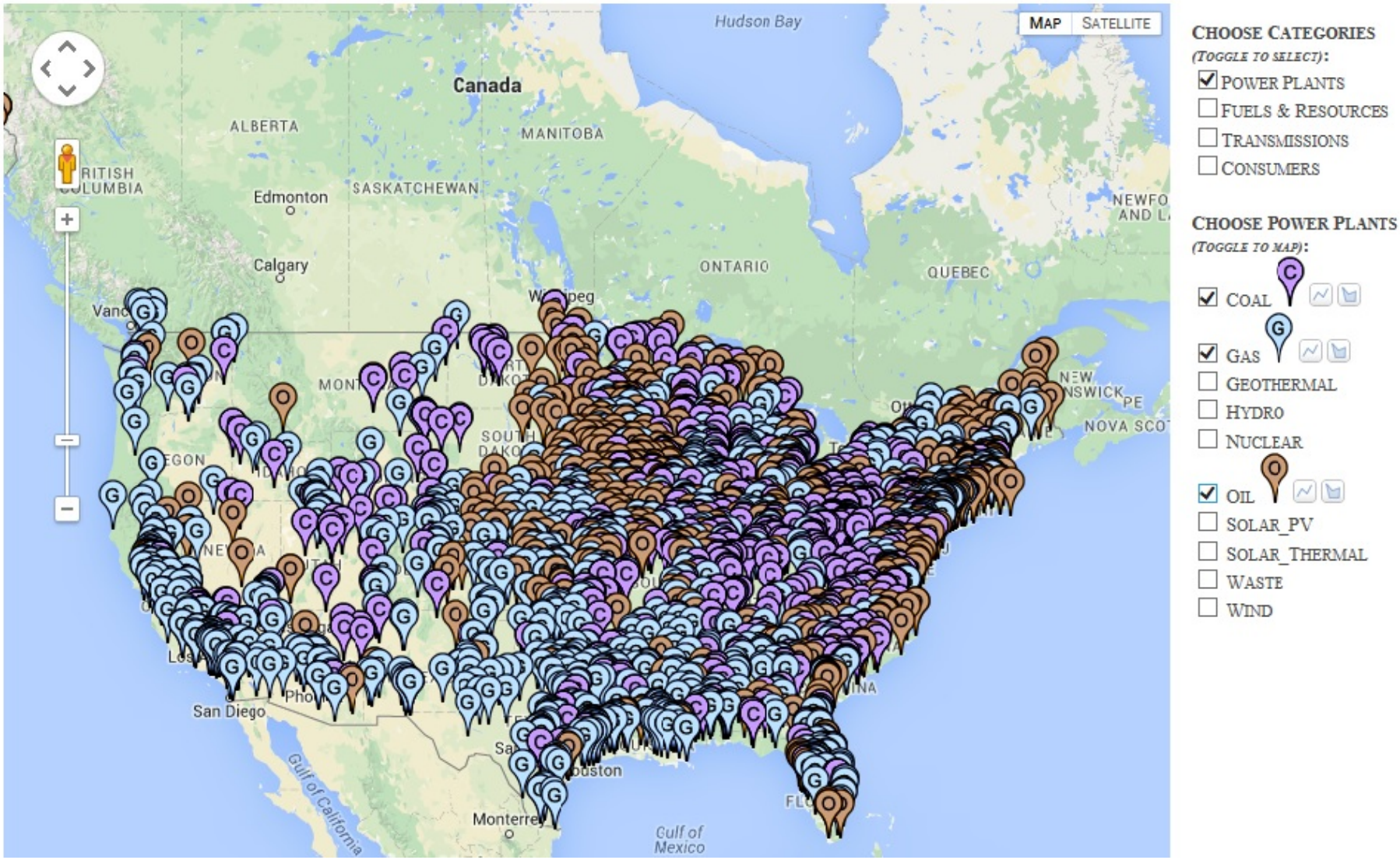
The five sections of CPCE post-combustion CO_2 capture & utilization



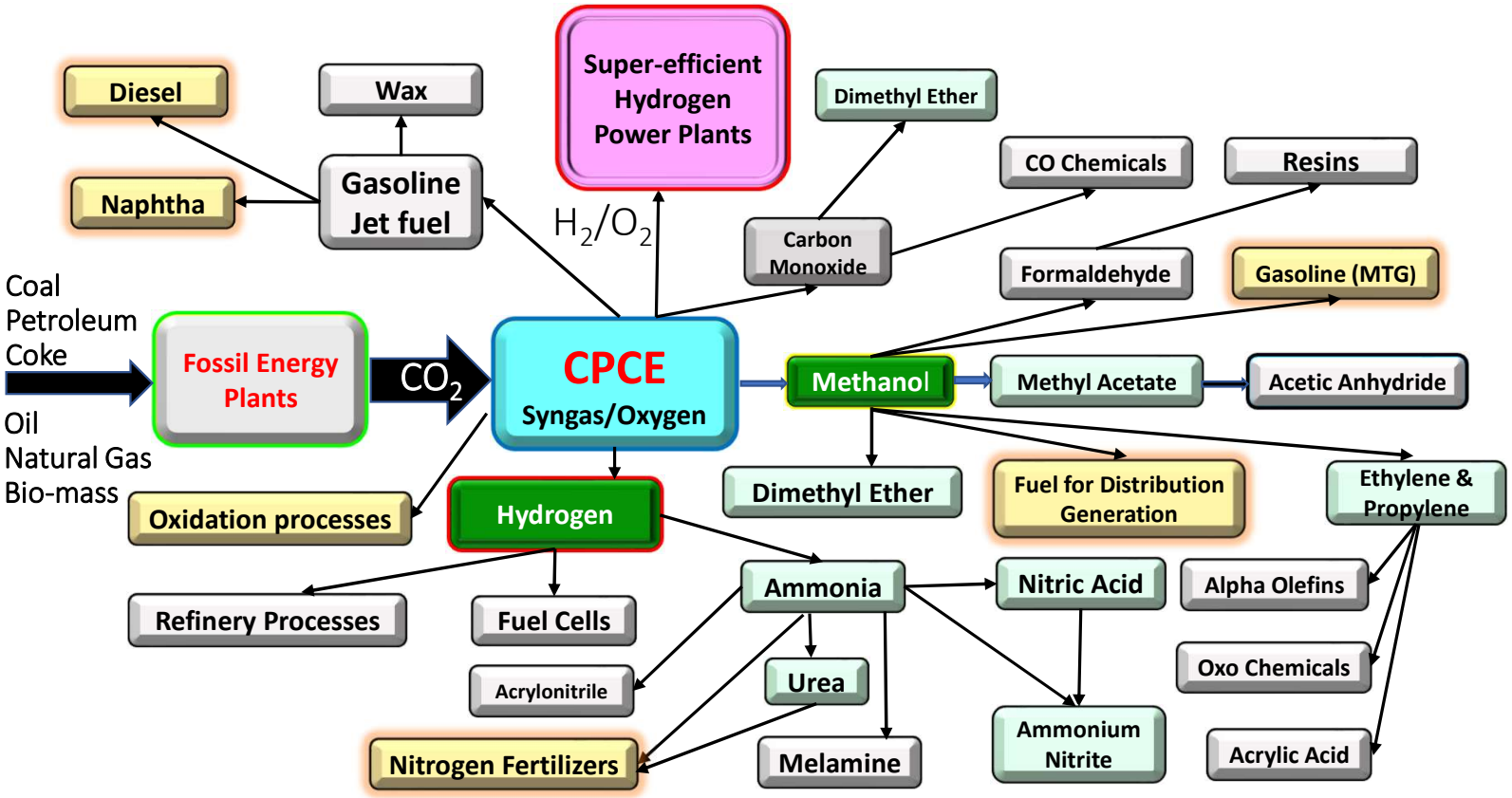
EVISA Engineering

The Spirit of Innovative Solutions

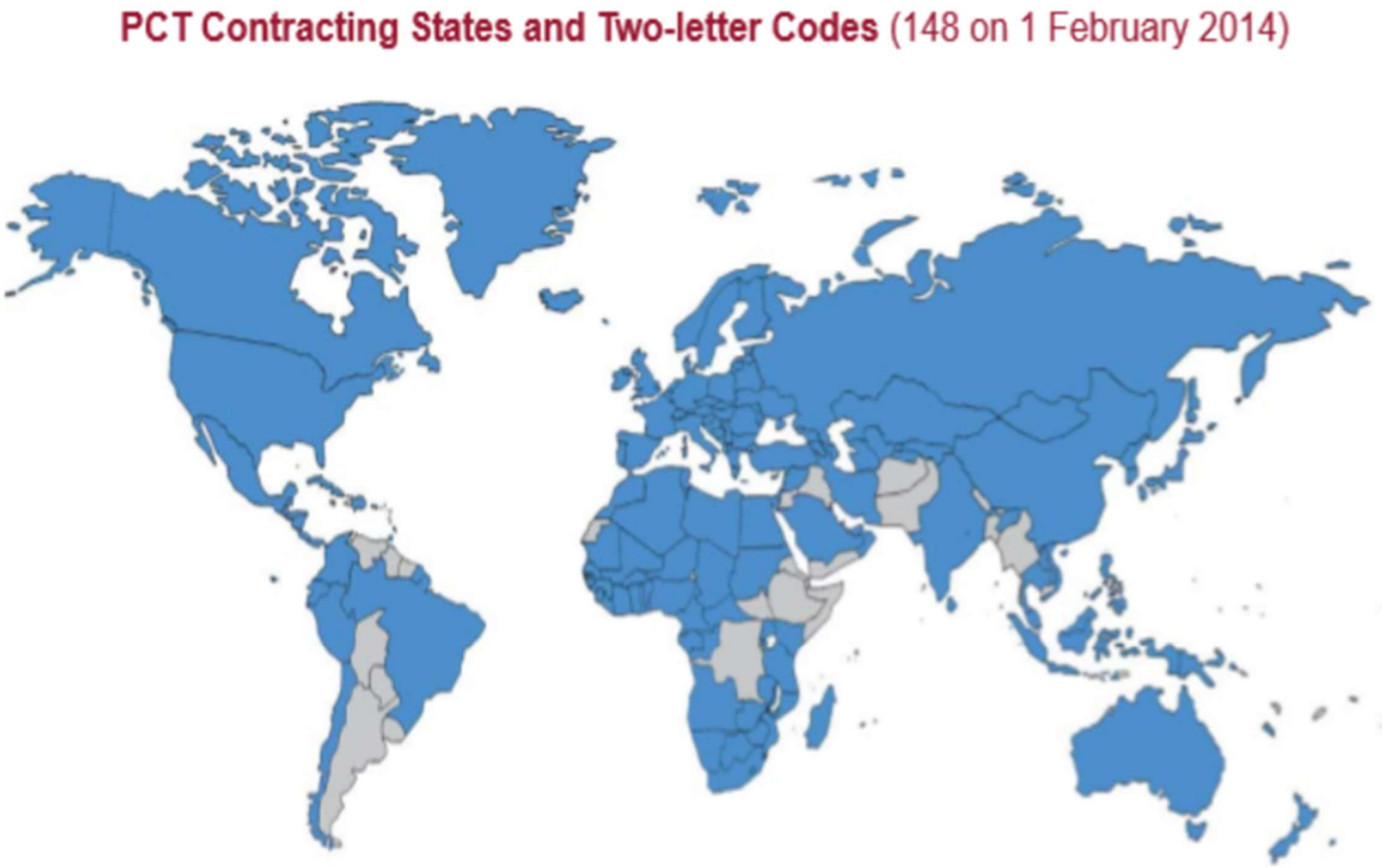
Market potential of CPCE as regards to retrofitting of existing fossil power plants for additional power, oxygen and syngas supply in the United States only



CPCE Process to Produce High-end Chemicals from CO_2 at lowest costs ever



International eligibility of the CPCE patent as per PCT/EU application on February 19, 2014 with PCT/EP241/000443



9710 Traville Gateway Drive, Suite 251
Rockville, Maryland 20850
U.S.A

Phone 240-426-9474
Email FBairamijamal@EVISA-Engineering.com
Web EVISA-Engineering.com