CLAIMS

1. A method for storing energy in the form of a biopolymer comprising:
   a) intermittently processing at least a portion of electric energy generated from a renewable and/or non-renewable energy source in an electrolysis process to produce at least H_2, O_2 or CO;
   b) intermittently passing at least one of H_2, O_2, or CO from the electrolysis process to a bioreactor containing a culture comprising a liquid nutrient medium and a microorganism capable of producing a biopolymer; and
   c) fermenting the culture.
2. The method according to claim 1, wherein the electrolysis process has a cost per unit electric energy.
3. The method according to claim 1, further comprising passing a C1 feedstock comprising one or both of CO and CO_2 from an industrial or syngas process to the bioreactor, wherein the C1 feedstock has a cost per unit.
4. The method according to claim 1, wherein the biopolymer has a cost per unit.
5. The method according to claim 2, further comprising passing at least a portion of the O_2 produced in the electrolysis process to a combustion or gasification process to produce the carbon dioxide.
6. The method according to claim 1, wherein the electric energy is generated by a renewable energy source.
7. The method according to claim 6, wherein the renewable energy source comprises solar energy, wind power, wave power, tidal power, hydro power, geothermal energy, biomass and/or biofuel combustion, nuclear, or any combination thereof.
8. The method according to claim 1, wherein intermittently passing comprises any time period between continuous passing of at least one of H_2, O_2, or CO and no passing of at least one of H_2, O_2, and CO for up to 0-2, 0-4, 0-6, 0-8 , 0-10, 0-12, or 0-16 hours.
9. The method according claim 2, wherein the electrolysis process is operated to supplement a C1 feedstock during time periods when the cost per unit electric energy is less than the cost per unit of C1 feedstock.
10. The method according to claim 1, wherein the microorganism is an autotrophic bacteria.
11. The method according to claim 10, wherein the autotrophic bacteria is *Cupriavidus necator*.
12. The method according to claim 1, wherein the biopolymer is a polyhydroxyalkanoate.

13. The method according to claim 1, wherein the microorganism is capable of co-producing a high nutrient protein.
14. The method according to claim 1, further comprising processing the microorganism to a generate a single cell protein (SCP) product.
15. The method according to claim 1, further comprising processing the microorganism to generate a cell-free protein synthesis platform.
16. A system for storing energy in the form of biopolymer comprising:
    a) an electrolysis process in intermittent fluid communication with a renewable and/or non-renewable energy source for producing at least one of H_2, O_2, or CO;
    b) an industrial plant for producing at least C1 feedstock;
    c) a bioreactor, in intermittent fluid communication with the electrolysis process and/or in continuous fluid communication with the industrial plant, comprising a reaction vessel suitable for intermittently growing, fermenting, and/or culturing and housing a microorganism capable of producing a biopolymer.
17. The system according to claim 16, further comprising at least one oxygen enriched combustion or gasification unit in fluid communication with the electrolysis process, the bioreactor, or both, the oxygen enriched combustion or gasification unit for producing carbon dioxide.
18. The system according to claim 16, further comprising at least one downstream processing system in fluid communication with the bioreactor selected from a recovery system, a purification system, an enriching system, a storage system, a recycling or further processing system for fermentation off-gas, hydrogen, water, oxygen, carbon dioxide, used medium and medium components, microorganism, or combinations thereof.
19. The system according to claim 16, further comprising a cell processing unit, in fluid communication with the bioreactor, wherein the microorganism is further processed to a single cell protein (SCP) and/or a cell-free protein synthesis platform.
20. The system according to claim 16, wherein the renewable energy source is selected from solar energy, wind power, wave power, tidal power, hydro power, geothermal energy, biomass and/or biofuel combustion, nuclear, or any combination thereof.
21. The system according to claim 16, wherein the microorganism is an autotrophic bacteria.
22. The system according to claim 21, wherein the autotrophic bacteria is *Cupriavidus necator.*
23. The system according to claim 16, wherein intermittent fluid communication comprises any time period between continuous passing of at least one of H_2, O_2, or CO and no passing of at least one of H_2, O_2, and CO for up to 0-2, 0-4, 0-6, 0-8 , 0-10, 0-12, or 0-16 hours.