CLAIMS

1. A multi-stage diffusion dialysis (MSDD) system for power generation using brine and fresh water comprising
   (a) a series of at least 4 stack tanks including a start stack tank to create ion imbalance, a restore stack tank to restore ion balance, an activate stack tank and a scavenge stack tank;
   (b) a plurality of chambers within each of the four stack tanks, wherein the chambers contain either brine solution or fresh water, and the chambers are created by partitioning the stack tanks with ion exchange membranes; and
   (c) a pair of cathode and anode for each pair of chambers within the stack tanks, wherein when there is an excess of sodium ions in a chamber due to either outward diffusion of Cl- ions to, or inward diffusion of Na+ from, neighbouring chambers, the excess sodium ions will gather at the cathode and attract electron at the adjacent chamber through the anode, or wherein when there is an environment of excess chlorine ions due to either outward diffusion of Na+ ions to, or inward diffusion of Cl- ions from, neighbouring chambers will cause Cl- to gather at the anode and release electrons, and an external circuit thereby the flowing of electron will result from the potential difference between Na+ and Cl- being tapped to generate an electrical potential and an electrical current is created.

2. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein brine and fresh water are directed into the start stack tank, the restore stack tank, the activate stack tank and the scavenge stack tank.

3. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein when brine flows into chambers with anion exchange membranes (AEMs) on both sides, only Cl ions diffuse to adjacent fresh water chamber and remaining Na ion in the chamber forming Na ion greater than Cl ion imbalance environment.

4. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein the fresh water flows into the chambers that are positioned between the two anion exchange membranes (AEMs), and only Cl ions diffuse into the chamber forming Cl ion greater than Na ion imbalance environment.

5. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein when brine flows into chambers with cation exchange membranes (CEMs) on both sides, and only Na ions diffuse into fresh water chamber resulting Cl ion remains forming Cl ion greater than Na ion imbalance environment.

6. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein the fresh water flows into the chambers that are positioned between the two cation exchange membranes (CEMs), and only Na ions diffuse into the chamber forming Na ion greater than Cl ion imbalance environment.

7. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein the chambers are mounted with electrode and/or without electrode.

8. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein in the fresh water chamber where there is anion exchange membrane (AEM) on one side and cation exchange membrane (CEM) on the other side at activate tank and scavenger tank, the Na ion and Cl ion from the adjacent brine chamber are attracted to each other.

9. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein

   (a) there are excess Na+ ions, thus forming a positive charge abundant environment, and the positive charges gather at the tip of the cathode and attract electrons from the adjacent chamber through a copper wire and the anode, resulting in an electric current flow;

   (b) there are excess Cl- ions, thus forming a negative charge abundant environment, and the negative charges gather at the tip of the anode and release electrons to the adjacent chamber through a copper wire and the cathode, resulting in an electric current flow.

10. The multi-stage diffusion dialysis system for power generation as set forth in Claim 9, wherein the positive charge abundant brine is directed to the scavenger stack tank, and the excess Na+ ion is passed through the cation exchange membranes (CEMS) and go into the adjacent fresh water chambers.

11. The multi-stage diffusion dialysis system for power generation as set forth in Claim 1, wherein an ion donating chamber is a brine chamber enclosed by anion exchange membrane (AEM) and cation exchange membrane (CEM), and an ion receiving chamber is a fresh water chamber enclosed by anion exchange membrane (AEM) and cation exchange membrane (CEM), and both of the chambers are in ion balanced condition, and wherein the ion donating and the ion receiving chamber are placed to overcome low ion diffusion rate, in order to efficiently create an imbalanced state in the ion concentration of the neighbouring chambers.

12. A method of power generation using multi-stage diffusion dialysis system comprising the step of :

    (a) directing brine and fresh water into a series of 4 tanks having a plurality of chambers, including a start stack tank, a restore stack tank, an activate stack tank and a scavenge stack tank, wherein a pair of cathode and anode for each pair of chambers within the stack tanks:

    (b) causing the fresh water in start stack tank to flow into chambers located between the brine chambers;

    (c) driving Cl- ions in the brine chambers with anion exchange membrane (AEM) on both sides to pass to the adjacent fresh water chamber; and remaining Na+ ions in the brine chamber to form a positive charge abundant environment; and

    (d) forming a circuit by attracting electrons from the negative charge and travelling through the anode at the fresh water chamber, and a copper wire towards the cathode to form electric current.

13. The method of power generation of Claim 12, wherein in the fresh water chamber, ion receiving chamber, the Na+ ion and the Cl- ions attract each other.

14. The method of power generation of Claim 12 wherein the ion exchange resin acts as a quick conductor in the circuit, replaces the water space in the chamber, serves as an agitator or static mixer, and an ion concentration stabiliser, and wherein the electrodes in the chambers have reduced circuit resistance of the system.

15. The method of power generation of Claim 12, wherein the brine chamber, excess Na ion pass through the cation exchange membranes (CEMs) to the fresh water chamber, which generating a positive charge abundant environment in the fresh water chambers.

16. The method of power generation of Claim 12, wherein the ion donating chamber and ion receiving chamber being intentionally designed are used to promote an imbalance of ions, which causes potential difference.

17. The method of power generation of Claim 12, wherein HClO is generated in the Cl ion rich environments, which prevents membrane fouling at the membranes.

18. The method of power generation of Claim 12, wherein the electrochemical potential energy difference between these separated Na and Cl ions is being tapped on to generate power.