CLAIMS

1. A wireless power receiver for use with a wireless power transmitter having a first converting unit that converts an input power having a first DC voltage to an AC voltage and transmit the input power via a primary coil, the wireless power receiver comprising:

a secondary coil configured to receive the input power having the AC voltage from the primary coil;

a second converting unit configured to convert the AC voltage of the input power to a second DC voltage, and provide the input power having the second DC voltage to an electric load;

a voltage sensor electrically coupled to the electric load and configured to determine the second DC voltage across the electric load;

a switching unit comprising:

a first switch electrically coupled in a first branch of the second converting unit;

a second switch electrically coupled in a second branch of the second converting unit; and

a controller electrically coupled to the first switch and the second switch and configured to

activate the first switch and the second switch to decouple the electric load from the secondary coil if the second DC voltage across the electric load is greater than a first threshold value,

regulate the second DC voltage across the electric load if a difference between the second DC voltage and a voltage reference value is above a predefined value,

generate a first control signal when the second DC voltage across the electric load is greater than the first threshold value, and

generate a second control signal when the second DC voltage across the electric load is lesser than a second threshold; and

a first transceiver configured to:

receive one of the first control signal and the second control signal from the controller, and

transmit one of the first control signal and the second control signal to a second transceiver of the wireless power transmitter.

2. The wireless power receiver of claim 1, wherein the secondary coil is configured to magnetically couple to the primary coil, and wherein the primary coil is configured to receive

a primary current from the first converting unit and the secondary coil is configured to transmit a secondary current to the second converting unit.

3. The wireless power receiver of claim 2, wherein the controller is further configured to:

generate a first switching signal and a second switching signal based on the first control signal; and

send the first switching signal and the second switching signal to activate the first switch and the second switch respectively to short-circuit the secondary coil.

4. The wireless power receiver of claim 3, wherein the controller is further configured to:

receive a current signal representative of the secondary current of the secondary coil from a current sensor;

generate a third switching signal and a fourth switching signal based on the second control signal and the secondary current, wherein the third switching signal and the fourth switching signal are complementary to each other; and

send the third switching signal and the fourth switching signal to the first switch and the second switch respectively to couple the electric load to the secondary coil.

5. The wireless power receiver of claim 4, wherein each of the third switching signal and the fourth switching signal includes a plurality of switching pulses corresponding to the secondary current of the secondary coil.

6. The wireless power receiver of claim 5, wherein the controller is further configured to:

generate a third control signal having a predefined duty cycle if a difference between the second DC voltage and the voltage reference value is above a predefined value;

generate a fifth switching signal and a sixth switching signal based on the third control signal and the secondary current of the secondary coil, wherein the fifth switching signal and the sixth switching signal are complementary to each other; and

send the fifth switching signal and the sixth switching signal to the first switch and the second switch respectively to couple the electric load to the secondary coil and to regulate the second DC voltage across the electric load.

7. The wireless power receiver of claim 1, further comprising the first transceiver electrically coupled to the voltage sensor and configured to:

receive a voltage signal representative of the second DC voltage across the electric load measured by the voltage sensor;

transmit the voltage signal to the second transceiver of the wireless power transmitter.

8. The wireless power receiver of claim 7, wherein the first control signal is configured to cause the wireless power transmitter to deactivate the first converting unit.

9. The wireless power receiver of claim 7, wherein the second control signal is configured to cause the wireless power transmitter to adjust a switching frequency of the first converting unit based on the voltage signal representative of the second DC voltage across the electric load.

10. The wireless power receiver of claim 9, wherein the switching frequency is adjusted to regulate the second DC voltage across the electric load.

11. The wireless power receiver of claim 7, wherein the controller is configured to receive a reset signal from the wireless power transmitter via the second transceiver and the first transceiver.

12. The wireless power receiver of claim 11, wherein the controller is configured to generate the second control signal if the reset signal is received.

13. The wireless power receiver of claim 1, wherein the controller is configured to regulate the electrical current, the second DC voltage, or both across the electric load based on electrical charge in the electric load.

14. A method for operating a wireless power receiver for use with a wireless power transmitter having a first converting unit that converts an input power having a first DC voltage to an AC voltage and transmit the input power via a primary coil, the method comprising:

receiving, by a secondary coil, the input power having the AC voltage from the primary coil;

converting, by a second converting unit, the AC voltage of the input power to a second DC voltage

providing the input power having the second DC voltage from the second converting unit to an electric load;

decoupling, by a switching unit, the electric load from the secondary coil if the second DC voltage across the electric load is greater than a first threshold value, wherein decoupling the electric load includes activating a first switch and a second switch, the first switch electrically coupled in a first branch of the second converting unit, and the second switch electrically coupled in a second branch of the second converting unit;

transmitting, by a first transceiver of the wireless power receiver to a second transceiver of the wireless power transmitter, a first control signal when the second DC voltage across the electric load is greater than the first threshold value; and

transmitting, by the first transceiver, a second control signal when the second DC voltage across the electric load is lesser than a second threshold value.

15. The method of claim 14, further comprising regulating, by the switching unit, the second DC voltage across the electric load if a difference between the second DC voltage and a voltage reference value is above a predefined value.

16. The method of claim 14, wherein decoupling the electric load further includes:

determining, by a voltage sensor, the second DC voltage across the electric load; and

activating, by a controller, the first switch and the second switch to decouple the electric load from the secondary coil if the determined second DC voltage is greater than the first threshold value.

17. The method of claim 16, further comprising deactivating one of the first switch and the second switch and activating other of the first switch and the second switch to couple the electric load to the secondary coil if the determined second DC voltage is less than a second threshold value.

18. The method of claim 14, wherein the first control signal is configured to cause the wireless power transmitter to deactivate the first converting unit, and wherein the second control signal is configured to cause the wireless power transmitter to adjust a switching frequency of the first converting unit based on the second DC voltage across the electric load.