CLAIMS

What is claimed is:

1. A power transfer system to transfer power between a DC source and a variable load, the system comprising:

first and second self-synchronous radio frequency rectifiers/amplifiers configured to extract first and second high frequency (HF) power signals from the DC source at respectively first and second frequencies;

an HF power link system configured to receive and mix the first and second HF power signals to produce a transferred power signal; and

a power signal conversion circuit in communication with the HF power link system and the variable load and configured to produce, based at least in part on the transferred power signal, an output power signal and supply the output power signal to the variable load.

2. The system of claim 1, further comprising an HF switching signal generator configured to supply first and second switching signals to the first and second rectifiers/amplifiers at the respective first and second frequencies and to establish and control a mutual phase relationship between the first and second switching signals.

3. The system of claim 2, wherein the power signal conversion circuit comprises:

a switched mode rectifier configured to receive the transferred power signal from the HF power link system and rectify the transferred power signal to produce a rectified power signal; and

an unfolding circuit configured to receive the rectified power signal from the switched mode rectifier and unfold the rectified power signal to produce the output power signal.

4. The system of claim 3, wherein the first and second self-synchronous radio frequency rectifiers/amplifiers are configured to operate in a rectifying mode and the switched mode rectifier is configured to operate in an always-on mode, thereby allowing power to be extracted from the variable load and transferred to the DC source via the power signal conversion circuit and the HF power link system.

5. The system of claim 2, wherein:

the first and second frequencies are the same frequency; and

the first and second switching signals have a mutual phase difference adjustable by the HF switching signal generator.

6. The system of claim 5, wherein the HF switching signal generator is configured to adjust the mutual phase difference between the first and second switching signals based on a DC level

in the variable load to thereby produce from the HF power link system the transferred power signal as a DC signal correspondingly adjusted in amplitude.

7. The system of claim 5, wherein the HF switching signal generator is configured to modulate, based at least in part on a modulation function, the mutual phase difference between the first and second switching signals at a phase modulation frequency that is derived from a frequency of a power signal in the variable load to thereby produce from the HF power link system the transferred power signal as an AC power signal modulated at the frequency of the power signal in the variable load.

8. The system of claim 2, wherein the first and second frequencies differ by a difference frequency.

9. The system of claim 8, wherein the HF switching signal generator is configured to determine the first and second frequencies and to set the difference frequency to double the frequency of the power signal in the variable load.

10. The system of claim 8, wherein:

the HF power link system is configured to produce the transferred power signal at the difference frequency; and

the power signal conversion circuit is configured to supply the output power signal to the variable load at the frequency of the power signal in the variable load.

11. The system of claim 1, wherein the HF power link system comprises a wireless power link.

12. The system of claim 11, wherein the wireless HF power link system comprises a bimodal wireless HF power link system.

13. The system of claim 1, wherein the HF power link system comprises a wired HF power link.

14. A method for transferring power between a DC source and a variable load, the method comprising:

extracting, from the DC source at first and second high frequency (HF) frequencies, corresponding first and second HF power signals via corresponding first and second self-synchronous radio frequency rectifiers/amplifiers;

receiving and mixing, in an HF power link system, the first and second HF power signals to produce a transferred power signal;

producing, in a power signal conversion circuit in communication with the HF power link system and the variable load, an output power signal based at least in part on the transferred power signal; and

supplying the output power signal to the variable load.

15. The method of claim 14, further comprising:

generating, in an HF switching signal generator in communication with the first and second rectifiers/amplifiers, first and second switching signals at the respective first and second frequencies; and

establishing and controlling, in the HF switching signal generator, a mutual phase relationship between the first and second switching signals.

16. The method of claim 14, further comprising:

receiving and rectifying, in a switched mode rectifier of the power signal conversion circuit, the transferred power signal from the HF power link system; and

receiving and unfolding, in an unfolding circuit of the power signal conversion circuit, the rectified power signal from the switched mode rectifier.

17. The method of claim 16, further comprising:

setting the first and second self-synchronous radio frequency rectifiers/amplifiers to a rectifying mode;

setting the switched mode rectifier to an always-on mode,

extracting power from the variable load; and

transferring the extracted power to the DC source via the power signal conversion circuit and the HF power link system.

18. The method of claim 15, wherein the transferring the power signal in the HF power link system comprises wirelessly transferring the power signal.

19. The method of claim 18, wherein the wirelessly transferring the power signal in the HF power link system comprises bimodally and wirelessly transferring the power signal.

20. The method of claim 15, wherein the transferring the power signal in the HF power link system comprises transferring the power signal via a wired connection.

21. The method of claim 15, wherein the first and second frequencies of the first and second switching signals are the same frequency; and the first and second switching signals have a mutual phase difference adjustable by the HF switching signal generator.

22. The method of claim 21, further comprising adjusting the mutual phase difference between the first and second switching signals based on a DC level in the variable load to produce from the HF power link system the transferred power signal as a DC signal correspondingly adjusted in amplitude.

23. The method of claim 21, further comprising modulating, based at least in part on a modulation function, the mutual phase difference between the first and second switching signals at a phase modulation frequency that is derived from a frequency of a power signal in the variable load to produce from the HF power link system the transferred power signal as an AC power signal modulated at the frequency of the power signal in the variable load.

24. The method of claim 15 further comprising:

determining the first and second frequencies of the corresponding first and second switching signals; and

setting the difference frequency equal to double the frequency of the power signal in the variable load.

25. The method of claim 24, further comprising:

producing the transferred power signal from the HF power link system at the difference frequency; and

supplying the output power signal to the variable load at the frequency of the power signal in the variable load.