CLAIMS

What is claimed is:

~~1. A sealed bidirectional power transfer circuit device comprising a plurality of terminals disposed for communicating electrically with devices external to the sealed device, the sealed device comprising within a sealed interior:~~

~~a multiterminal power switching device comprising at least one DC terminal, at least one AC terminal, and at least one control terminal, the multiterminal power switching device adjustable between an amplifying condition and a rectifying condition, and arranged for:~~

~~bidirectionally communicating via the at least one DC terminal a DC voltage and a DC current, and~~

~~bidirectionally communicating via the at least one AC terminal a radio frequency power signal having an amplitude, a frequency, and a phase;~~

~~in wired data communication with a controller, a phase, frequency, and duty cycle adjustment circuit in wired electrical communication with the power switching device via the at least one control terminal, the controller arranged for:~~

~~establishing at the at least one control terminal of the power switching device a radio frequency oscillating signal having the frequency and the phase of the radio frequency power signal, and~~

~~adjusting the power switching device between the amplifying condition and the rectifying condition by adjusting under instruction of the controller the phase of the radio frequency oscillating signal.~~

~~2. The sealed power transfer circuit device of claim 1, wherein the radio frequency power signal has a duty cycle and the phase, frequency, and duty cycle adjustment circuit is~~

~~further arranged for adjusting the duty cycle of the radio frequency power signal by adjusting a duty cycle of the radio frequency oscillating signal.~~

~~3. The sealed power transfer circuit device of claim 1, wherein the phase, frequency, and duty cycle adjustment circuit comprises a radio frequency oscillator for producing under instruction from the controller the radio frequency oscillating signal.~~

~~4. The sealed power transfer circuit device of claim 1, further comprising within the sealed interior in wired data communication with the controller a tuning network in wired electrical communication with the power switching device via the at least one AC terminal, the tuning network arranged for adjusting under instruction from the controller the radio frequency power signal to a tuned radio frequency power signal.~~

~~5. The bidirectional power transfer circuit device of claim 4, comprising a modulator configured for modulating information onto the radio frequency power signal.~~

~~6. The bidirectional power transfer circuit device of claim 5, wherein the modulator comprises the tuning network.~~

~~7. The bidirectional power transfer circuit device of claim 5, wherein the modulator is configured for modulating the radio frequency power signal with information provided by the controller.~~

~~8. The sealed power transfer circuit device of claim 4, wherein the tuning network comprises a harmonic termination network circuit arranged for suppressing harmonics of the radio frequency oscillating signal in the radio frequency power signal.~~

~~9. The sealed power transfer circuit device of claim 8, wherein the harmonic termination network comprises one or more inductors and one or more of a first harmonic termination, a second harmonic termination, and a third harmonic termination.~~

~~10. The sealed power transfer circuit device of claim 4, further comprising within the sealed interior in wired data communication with the controller an amplitude/frequency/phase~~

~~detector disposed in wired electrical communication with the tuning network and arranged to determine an amplitude, a frequency and a phase of any radio frequency power signal communicated between the tuning network and an AC load/source external to the sealed device.~~

~~11. The sealed power transfer circuit device of claim 10, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to receive instructions from the controller based on measurement data communicated by the amplitude/frequency/phase detector to the controller.~~

~~12. The sealed power transfer circuit device of claim 10, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to adjust the radio frequency oscillating signal based on a feedback signal received directly from the amplitude/frequency/phase detector.~~

~~13. The sealed power transfer circuit device of claim 10, wherein the tuning network comprises a voltage-current tuner for adjusting a phase difference between a voltage and a current of the tuned radio frequency power signal based on measurement data from the amplitude/frequency/phase detector when the power switching device is in the amplifying condition.~~

~~14. The sealed power transfer circuit device of claim 10, further comprising within the sealed interior in wired electrical communication between the power switching device and a DC power source/load external to the sealed device a power management circuit arranged for impedance matching the power switching device and the external DC power source/load and for adjusting DC power communicated between the power switching device and the DC power source/load based on a feedback signal received directly from the amplitude/frequency/phase detector.~~

~~15. The sealed power transfer circuit device of claim 10, further comprising within the sealed interior in wired data communication with the controller and in wired electrical~~

~~communication between the power switching device and a DC power source/load external to the sealed device a power management circuit arranged for impedance matching the power switching device and the external DC power source/load and for adjusting DC power communicated between the power switching device and the DC power source/load based on measurement data communicated by the amplitude/frequency/phase detector to the controller.~~

~~16. The sealed power transfer circuit device of claim 15, further comprising within the sealed interior in wired data communication with the controller a voltage/current-detector disposed to determine a DC voltage and DC current passed between the power switching device and the power management circuit.~~

~~17. The sealed power transfer circuit device of claim 16, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to receive instructions from the controller based on measurement data communicated by the voltage/current-detector to the controller.~~

~~18. The sealed power transfer circuit device of claim 16, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to adjust the radio frequency oscillating signal based on a feedback signal received directly from the voltage/current-detector.~~

~~19. The sealed power transfer circuit device of claim 16, further comprising within the sealed interior a memory in wired data communication with the controller, with the amplitude/frequency/phase detector, and with the voltage/current detector wherein the memory is arranged to receive and store measurement data from the two detectors and to provide the signal data from the two detectors to the controller.~~

~~20. The sealed power transfer circuit device of claim 10, further comprising within the sealed interior in wired electrical communication between the power switching device and the AC power source/load external to the sealed device a power management circuit arranged for matching an amplitude, a frequency, and a phase of the power switching device and the external AC power source/load and for adjusting AC power communicated between the~~

~~power switching device and the AC power source/load based on a feedback signal received directly from the amplitude/frequency/phase detector.~~

~~21. The sealed power transfer circuit device of claim 10, further comprising within the sealed interior in wired data communication with the controller and in wired electrical communication between the power switching device and the AC power source/load external to the sealed device a power management circuit arranged for matching an amplitude, a frequency, and a phase of the power switching device and the external AC power source/load the power switching device and for adjusting AC power communicated between the power switching device and the AC power source/load based on measurement data communicated by the amplitude/frequency/phase detector to the controller.~~

~~22. The sealed power transfer circuit device of claim 21, further comprising within the sealed interior in wired data communication with the controller a voltage/current-detector disposed to determine a DC voltage and DC current passed between the power switching device and the power management circuit.~~

~~23. The sealed power transfer circuit device of claim 22, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to receive instructions from the controller based on measurement data communicated by the voltage/current-detector to the controller.~~

~~24. The sealed power transfer circuit device of claim 22, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to adjust the radio frequency oscillating signal based on a feedback signal received directly from the voltage/current-detector.~~

~~25. The sealed power transfer circuit device of claim 22, further comprising within the sealed interior a memory in wired data communication with the controller, with the amplitude/frequency/phase detector, and with the voltage/current detector wherein the memory is arranged to receive and store measurement data from the two detectors and to provide the signal data from the two detectors to the controller.~~

~~26. The sealed power transfer circuit device of claim 10, wherein the tuning network further comprises one or more of a compensation network, a matching network, and a filter.~~

~~27. The sealed power transfer circuit device of claim 1, comprising within the sealed interior the controller.~~

~~28. The sealed power transfer circuit device of claim 27, further comprising within the sealed interior at least one of a Bluetooth communication circuit, a WiFi communication circuit, a Zigbee communication circuit and a cellular communications technology circuit for communicating information between the controller and devices external to the sealed power transfer circuit device.~~

~~29. The sealed power transfer circuit device of claim 28, wherein the communication circuit is in bidirectional wired communication with at least one communications antenna arranged to communicate with devices external to the sealed power transfer circuit device.~~

~~30. The sealed power transfer circuit device of claim 29, wherein the antenna is disposed within the sealed interior of the sealed device.~~

~~31. The sealed power transfer circuit device of claim 1, wherein the plurality of terminals includes terminals for data communication between the controller and devices exterior to the sealed interior.~~

~~32. The bidirectional power transfer circuit device of claim 1, comprising a modulator configured for modulating information onto at least one of the radio frequency power signal and the DC voltage.~~

~~33. The bidirectional power transfer circuit device of claim 32, wherein the modulator comprises the power switching device.~~

~~34. The bidirectional power transfer circuit device of claim 33, wherein the modulator is configured for modulating the at least one of the radio frequency power signal and the DC voltage with information provided by the controller.~~

~~35. The bidirectional power transfer circuit device of claim 33, wherein the modulator further comprises the phase, frequency, and duty cycle adjustment circuit.~~

~~36. The sealed power transfer circuit device of claim 1, wherein all circuit elements of the device are monolithically integrated in a silicon single crystal wafer.~~

~~37. The sealed power transfer circuit device of claim 1, wherein at least a portion of circuit elements of the device are integrated by flip-chip technology.~~

~~38. A monolithically integrated power device comprising on a silicon single crystal wafer at least one photovoltaic cell in electrical communication with a bidirectional power transfer circuit comprising a plurality of terminals disposed for communicating electrically with devices external to the power transfer circuit, the power transfer circuit comprising:~~

~~a multiterminal power switching device comprising at least one DC terminal, at least one AC terminal, and at least one control terminal, the multiterminal power switching device adjustable between an amplifying condition and a rectifying condition, and arranged for:~~

~~bidirectionally communicating via the at least one DC terminal a DC voltage and a DC current, and~~

~~bidirectionally communicating via the at least one AC terminal a radio frequency power signal having an amplitude, a frequency, and a phase;~~

~~in wired data communication with a controller, a phase, frequency, and duty cycle adjustment circuit in wired electrical communication with the power switching device via the at least one control terminal, and arranged for:~~

establishing at the at least one control terminal of the power switching device a radio frequency oscillating signal having the frequency and the phase of the radio frequency power signal, and

adjusting the power switching device between the amplifying condition and the rectifying condition by adjusting under instruction of the controller the phase of the radio frequency oscillating signal.

39. The power device of claim 38, wherein the radio frequency power signal has a duty cycle and the phase, frequency, and duty cycle adjustment circuit is further arranged for adjusting the duty cycle of the radio frequency power signal by adjusting a duty cycle of the radio frequency oscillating signal.

40. The power device of claim 38, wherein the phase, frequency, and duty cycle adjustment circuit comprises a radio frequency oscillator for producing under instruction from the controller the radio frequency oscillating signal.

41. The power device of claim 38, further comprising in wired data communication with the controller a tuning network in wired electrical communication with the power switching device via the at least one AC terminal, the tuning network arranged for adjusting under instruction from the controller the radio frequency power signal to a tuned radio frequency power signal.

42. The power device of claim 41, further comprising on a surface of the silicon wafer a resonator in electrical communication with the tuning network.

43. The device of claim 42, wherein the resonator acts as a heat sink for the device.

44. The bidirectional power device of claim 41, comprising a modulator configured for modulating information onto the radio frequency power signal.

45. The power device of claim 43, wherein the modulator comprises the tuning network.

~~46. The power device of claim 43, wherein the modulator is configured for modulating the radio frequency power signal with information provided by the controller.~~

~~47. The power device of claim 41, wherein the tuning network comprises a harmonic termination network circuit arranged for suppressing harmonics of the radio frequency oscillating signal in the radio frequency power signal.~~

~~48. The sealed power transfer circuit device of claim 47, wherein the harmonic termination network comprises one or more inductors and one or more of a first harmonic termination, a second harmonic termination, and a third harmonic termination.~~

~~49. The power device of claim 41 further comprising in wired data communication with the controller an amplitude/frequency/phase detector disposed in wired electrical communication with the tuning network and arranged to determine an amplitude, a frequency and a phase of any radio frequency power signal communicated between the tuning network and an AC load/source external device.~~

~~50. The power device of claim 49, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to receive instructions from the controller based on measurement data communicated by the amplitude/frequency/phase detector to the controller.~~

~~51. The power device of claim 49, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to adjust the radio frequency oscillating signal based on a feedback signal received directly from the amplitude/frequency/phase detector.~~

~~52. The power device of claim 49, wherein the tuning network comprises a voltage-current tuner for adjusting a phase difference between a voltage and a current of the tuned radio frequency power signal based on measurement data from the amplitude/frequency/phase detector when the power switching device is in the amplifying condition.~~

~~53. The power device of claim 49, further comprising in wired data communication with the controller and in wired electrical communication between the power switching device and the at least one photovoltaic cell a power management circuit arranged for impedance matching the power switching device and the at least one photovoltaic cell and for adjusting DC power communicated between the power switching device and the at least one photovoltaic cell based on measurement data communicated by the amplitude/frequency/phase detector to the controller.~~

~~54. The power device of claim 49, further comprising in wired electrical communication between the power switching device and the at least one photovoltaic cell a power management circuit arranged for impedance matching the power switching device and the at least one photovoltaic cell and for adjusting DC power communicated between the power switching device and the at least one photovoltaic cell based on a feedback signal received directly from the amplitude/frequency/phase detector.~~

~~55. The power device of claim 53, further comprising in wired data communication with the controller a voltage/current-detector disposed to determine a DC voltage and DC current passed between the power switching device and the power management circuit.~~

~~56. The power device of claim 55, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to receive instructions from the controller based on measurement data communicated by the voltage/current-detector to the controller.~~

~~57. The power device of claim 55, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to adjust the radio frequency oscillating signal based on a feedback signal received directly from the voltage/current-detector.~~

~~58. The power device of claim 55, further comprising a memory in wired data communication with the controller, with the amplitude/frequency/phase detector, and with the voltage/current detector wherein the memory is arranged to receive and store measurement~~

~~data from the two detectors and to provide the signal data from the two detectors to the controller.~~

~~59. The power device of claim 49, wherein the tuning network further comprises one or more of a compensation network, a matching network, and a filter.~~

~~60. The power device of claim 38, wherein the controller is integrated with the power device.~~

~~61. The power device of claim 60, further comprising at least one of a Bluetooth communication circuit, a WiFi communication circuit, a Zigbee communication circuit and a cellular communications technology circuit for communicating information between the controller and devices external to the power device.~~

~~62. The power device of claim 61, wherein the communication circuit is in bidirectional wired communication with at least one communications antenna arranged to communicate with devices external to the power device.~~

~~63. The power device of claim 62, wherein the antenna is integrated within the power device.~~

~~64. The power device of claim 38, wherein the plurality of terminals includes terminals for data communication between the controller and devices exterior to the power device.~~

~~65. The power device of claim 38, comprising a modulator configured for modulating information onto at least one of the radio frequency power signal and the DC voltage.~~

~~66. The power device of claim 65, wherein the modulator comprises the power switching device.~~

~~67. The power device of claim 66, wherein the modulator is configured for modulating the at least one of the radio frequency power signal and the DC voltage with information provided by the controller.~~

~~68. The power device of claim 66, wherein the modulator further comprises the phase, frequency, and duty cycle adjustment circuit.~~

~~69. A bimodal near-field resonant wireless radio frequency electrical power transfer system configured for simultaneous capacitive power transfer and inductive power transfer according to an adjustable transfer mode ratio of the capacitive power transfer to the inductive power transfer at a variable resonant power signal oscillation frequency, the system comprising:~~

~~a transmitter subsystem comprising a transmitter antenna and a power signal tuner module, wherein the power signal tuner module adjusts the transfer mode ratio by adjusting a power signal provided by the power signal tuner module to the transmitter antenna subsystem; and~~

~~a receiver subsystem comprising a receiver antenna subsystem to receive electrical power from the transmitter antenna at the transfer mode ratio.~~

~~70. The system of claim 69, wherein the system communicates information between the transmitter antenna subsystem and the receiver antenna subsystem via the transmitter antenna and a receiver antenna of the receiver antenna subsystem.~~

~~71. The system of claim 70, wherein the system further comprises a modulator for modulating information onto an information bearing signal and providing the information bearing signal to the transmitter antenna subsystem.~~

~~72. The system of claim 71, wherein the modulator is arranged to modulate the information bearing signal to the transmitter antenna subsystem according to the information.~~

~~73. The system of claim 72, wherein the power signal tuner module comprises the modulator.~~

~~74. The system of claim 71, wherein the information bearing signal has a frequency different from the variable resonant power signal oscillation frequency.~~

~~75. The system of claim 71, wherein the modulator modulates the information bearing signal by frequency modulation.~~

~~76. The system of claim 71, wherein the modulator modulates the information bearing signal by amplitude modulation.~~

~~77. The system of claim 71, wherein the modulator modulates the information bearing signal to the transmitter antenna subsystem by phase modulation.~~

~~78. The system of claim 71, wherein the information bearing signal is modulated such that the variable power signal oscillation frequency is a harmonic of a frequency of the information bearing signal.~~

~~79. The system of claim 71, wherein the information bearing signal is modulated onto a harmonic of the power signal.~~

~~80. The system of claim 71, wherein the signal modulated and provided to the transmitter antenna subsystem is the power signal.~~

~~81. The system of claim 71, wherein:~~

~~the modulator modulates a reflective characteristic of the receiver antenna; and~~

~~the modulator transfers the information from the receiver antenna subsystem to the transmitter antenna subsystem by modulating the reflective characteristic of the receiver antenna according to the information.~~

~~82. The system of claim 81, wherein a modulated reflective characteristic of the receiver antenna is an impedance of the receiver antenna.~~

~~83. The system of claim 70, wherein the system modulates the information onto an information bearing signal and provides the information bearing signal to the transmitter antenna subsystem.~~

~~84. The system of claim 70, wherein the system transfers the information from the receiver subsystem to the transmitter subsystem by modulating a reflection by the receiver antenna of a signal from the transmitter subsystem.~~

~~85. The system of claim 84, wherein the receiver subsystem modulates a reflective characteristic of the receiver antenna.~~

~~86. The system of claim 84, wherein the receiver subsystem modulates an impedance of the receiver antenna.~~

~~87. The system of claim 70, wherein:~~

~~a power load is present at an output of the receiver subsystem; and~~

~~the information comprises one or more of a presence of the power load, a charge level of the power load, a power transfer efficiency, a charging rate of the power load, a status of the power load, a presence of a voltage over the power load, a charge capacity of the power load, and a remaining time to charge the power load.~~

~~88. The system of claim 70, wherein the system communicates digital information between the transmitter subsystem and the receiver subsystem via the transmitter antenna.~~

~~89. The system of claim 70, wherein the system communicates analog information between the transmitter subsystem and the receiver subsystem via the transmitter antenna.~~

~~90. The system of claim 70, wherein the receiver subsystem is configured to transmit power to a subsequent receiver subsystem.~~

~~91. The system of claim 90, wherein the receiver subsystem further comprises a rectifier.~~

~~92. The system of claim 91, wherein the rectifier comprises a phase shifter~~

~~93. A bimodal resonant near-field radio frequency power transfer system comprising a plurality of power transmit-receive modules for simultaneous capacitive power transfer and inductive power transfer according to an adjustable transfer mode ratio via a power signal at a power signal frequency, wherein each of the plurality of power transmit-receive modules is in~~

~~wired communication with a transmitter-receiver resonator to exchange power with at least one other power transmit-receive module of the plurality of power transmit-receive modules.~~

~~94. The system of claim 93, wherein a first module of the plurality of power transmit-receive modules comprises a power signal tuner module for changing the adjustable transfer mode ratio by adjusting the power signal and providing an adjusted power signal to a first transmitter-receiver resonator in wired communication with the first power-transmit module.~~

~~95. The system of claim 94, wherein at least one transmit-receive module of the plurality of power transmit-receive modules comprises an associated transmitter-receiver resonator in wired communication with the at least one transmit-receive module and a modulator to modulate information onto a radio frequency signal exchanged between the associated transmitter-receiver resonator and an additional transmitter-receiver resonator in wired communication with any other transmit-receive module of the plurality of power transmit-receive modules.~~

~~96. The system of any one of claims 93 - 95, wherein each transmitter-receiver resonator serves as a heat sink for each power transmit-receive module which it is in wired communication with.~~

~~97. The system of claim 95, wherein:~~

~~a power load is present at an output of one of the plurality of power transmit-receive modules; and~~

~~the information comprises one or more of a presence of the power load, a charge level of the power load, a power transfer efficiency, a charging rate of the power load, a status of the power load, a presence of a voltage over the power load, a charge capacity of the power load, and a remaining time to charge the power load.~~

~~98. The system of claim 95, wherein the modulator is an amplitude modulator.~~

~~99. The system of claim 95, wherein the modulator is a frequency modulator.~~

~~100. The system of claim 95, wherein the modulator is a phase modulator.~~

~~101. The system of claim 95, wherein the information comprises digital information.~~

~~102. The system of claim 95, wherein the information comprises analog information~~

~~103. The system of claim 95, wherein the radio frequency signal is the power signal.~~

~~104. The system of claim 95, wherein the radio frequency signal has a frequency different from the power signal frequency.~~

~~105. The system of claim 95, wherein the radio frequency signal has a frequency that is a harmonic of the power signal frequency.~~

~~106. The system of claim 95, wherein the power signal frequency is a harmonic of the frequency of the radio frequency signal.~~

~~107. The system of claim 95, wherein the modulator modulates according to the information, a reflective characteristic of the associated transmitter-receiver resonator to impose the information on a signal reflected by the associated transmitter-receiver resonator.~~

~~108. The system of claim 95, wherein the modulator modulates, according to the information, a signal provided to the associated transmitter-receiver resonator.~~

~~109. The system of claim 95, wherein the power signal tuner module of the first module comprises the modulator.~~

~~110. The system of claim 95, wherein each power transmit-receive module of the plurality of power transmit-receive modules comprises a compensation network and the compensation network comprises the modulator.~~

~~111. The system of claim 95, wherein the at least one of the power transmit-receive modules comprises a radio frequency oscillator providing a signal at the power signal frequency to the at least one power transmit-receive module; and the radio frequency oscillator comprises the modulator.~~

~~112. The system of claim 94, wherein each power transmit-receive module of the plurality of power transmit-receive modules is reconfigurable between a power transmitter mode and a power receiver mode.~~

~~113. The system of claim 112, wherein each power transmit-receive module comprises a differential self-synchronous radio frequency power amplifier/rectifier capable of reconfiguring between an amplifier condition and a rectifier condition corresponding respectively to the power transmitter mode and the power receiver mode.~~

~~114. The system of claim 113, wherein each power transmit-receive module comprises a controller and reconfiguring between the amplifier condition and the rectifier condition is controlled by the controller.~~

~~115. The system of claim 114, wherein the differential self-synchronous radio frequency power amplifier/rectifier comprises a phase shifter adjustable by the controller for reconfiguring the differential self-synchronous radio frequency power amplifier/rectifier between the amplifier condition and the rectifier condition.~~

~~116. The system of claim 112, wherein each power transmit-receive module comprises a differential switched-mode self-synchronous radio frequency power amplifier/rectifier capable of reconfiguring between an amplifier condition and a rectifier condition corresponding respectively to the power transmitter mode and the power receiver mode.~~

~~117. A near-field radio frequency method for transferring power via a power signal at a power signal frequency, the method comprising:~~

~~providing a bimodal resonant near-field radio frequency power transfer system comprising a plurality of power transmit-receive modules, wherein each power transmit-receive module of the plurality of power transmit-receive modules is in wired communication with a transmitter-receiver resonator to exchange power with at least one other power transmit-receive module of the plurality of power transmit-receive modules; and~~

operating the power transfer system for simultaneous capacitive power transfer and inductive power transfer according to an adjustable transfer mode ratio.

118. The method of claim 117, wherein

providing the bimodal resonant near-field radio frequency power transfer system comprises providing a first of the plurality of power transmit-receive modules comprising a power signal tuner module, and

wherein operating the bimodal resonant near-field radio frequency power transfer system comprises changing the adjustable transfer mode ratio by adjusting the power signal tuner module.

119. The method of claim 117, wherein

providing the bimodal resonant near-field radio frequency power transfer system comprises providing at least one power transmit-receive module of the plurality of power transmit-receive modules in wired communication with an associated transmitter-receiver resonator comprising a modulator, and

wherein operating the power transfer system comprises exchanging a radio frequency signal between the associated transmitter-receiver resonator and a transmitter-receiver resonator in wired communication with at least one other transmit-receive module of the plurality of power transmit-receive modules; and modulating information onto the radio frequency signal.

120. The method of claim 119, wherein, when a power load is present at an output of one of the plurality of power transmit-receive modules, and wherein the information comprises one or more of a presence of the power load, a charge level of the power load, a power transfer efficiency, a charging rate of the power load, a status of the power load, a presence of a voltage over the power load, a charge capacity of the power load, and a remaining time to charge the power load.

~~121. The method of claim 119, wherein the modulating the information onto the exchanged radio frequency signal comprises amplitude modulating the radio frequency signal.~~

~~122. The method of claim 119, wherein the modulating the information onto the exchanged radio frequency signal comprises frequency modulating the radio frequency signal.~~

~~123. The method of claim 119, wherein the modulating the information onto the exchanged radio frequency signal comprises phase modulating the radio frequency signal.~~

~~124. The method of claim 119, wherein the modulating the information onto the exchanged radio frequency signal comprises modulating digital information onto the radio frequency signal.~~

~~125. The method of claim 119, wherein the modulating the information onto the exchanged radio frequency signal comprises modulating analog information onto the radio frequency signal.~~

~~126. The method of claim 119, wherein the modulating the information onto the radio frequency signal comprises modulating the information onto the power signal.~~

~~127. The method of claim 119, wherein the modulating the information onto the radio frequency signal comprises modulating the information onto a signal with a frequency different from the power signal frequency.~~

~~128. The method of claim 119, wherein the modulating the information onto the radio frequency signal comprises modulating the information onto a signal with a frequency that is a harmonic of the power signal frequency.~~

~~129. The method of claim 119, wherein the modulating the information onto the radio frequency signal comprises modulating the information onto a signal that has the power signal frequency as a harmonic.~~

~~130. The method of claim 119, wherein the modulating the information onto the radio frequency signal comprises modulating according to the information a reflective~~

~~characteristic of the associated wire-connected transmitter-receiver resonator to impose the information on a signal reflected by the wire-connected transmitter-receiver resonator.~~

~~131. The method of claim 119, wherein the modulating the information onto the radio frequency signal comprises modulating according to the information a signal provided to the associated transmitter-receiver resonator.~~

~~132. The method of claim 119, comprising operating the power signal tuner module of the first power transmit-receive modules to modulate the information onto the radio frequency signal.~~

~~133. The method of claim 119, wherein each of the power transmit-receive modules provided comprises a compensation network;~~

~~wherein the compensation network comprises the modulator; and~~

~~wherein the method comprises operating the compensation network to modulate the information onto the radio frequency signal.~~

~~134. The method of claim 119, wherein~~

~~the at least one power transmit-receive module comprises a radio frequency oscillator providing a signal at the power signal frequency to the at least one power transmit-receive module;~~

~~the radio frequency oscillator comprises the modulator; and~~

~~wherein the method further comprises modulating the information onto the radio frequency signal in the oscillator.~~

~~135. The method of claim 118, wherein~~

~~each power transmit-receive module of the plurality of power transmit-receive modules provided is reconfigurable between a power transmitter mode and a power receiver mode; and~~

~~wherein the method further comprises reconfiguring at least two power-transmit receive modules of the plurality of power transmit-receive modules between the power transmitter mode and the power receiver mode to reverse a direction of power transmission between the at least two transmit-receive modules.~~

~~136. The method of claim 135, wherein each power transmit-receive module comprises a differential self-synchronous radio frequency power amplifier/rectifier capable of reconfiguring between an amplifier condition and a rectifier condition corresponding respectively to the power transmitter mode and the power receiver mode; and~~

~~wherein the method further comprises reconfiguring the differential self-synchronous radio frequency power amplifiers/rectifiers of the at least two transmit-receive modules between the amplifier condition and the rectifier condition.~~

~~137. The method of claim 136, wherein~~

~~each differential self-synchronous radio frequency power amplifier/rectifier comprises a phase shifter adjustable for reconfiguring the differential self-synchronous radio frequency power amplifier/rectifier between the amplifier condition and the rectifier condition; and~~

~~wherein the method comprises adjusting the phase shifter of each of the differential self-synchronous radio frequency power amplifiers/rectifiers of the at least two transmit-receive modules.~~

1. A bidirectional power transfer system comprising:

a multiterminal power switching device comprising at least one DC terminal, at least one AC terminal, and at least one control terminal, the multiterminal power switching device adjustable between an amplifying condition and a rectifying condition, and arranged for:

bidirectionally communicating via the at least one DC terminal a DC voltage and a DC current, and

bidirectionally communicating via the at least one AC terminal a power signal having an amplitude, a frequency, and a phase;

a controller arranged for:

establishing at the at least one control terminal of the power switching device an oscillating signal having the frequency and the phase of the power signal, and for

adjusting the power switching device between the amplifying condition and the rectifying condition by adjusting the phase of the oscillating signal; and

a phase, frequency, and duty cycle adjustment circuit in wired data communication with the controller and in wired electrical communication with the power switching device via the at least one control terminal.

2. The bidirectional power transfer system of claim 1, wherein:

the power signal has a duty cycle;

the phase, frequency, and duty cycle adjustment circuit comprises a oscillator for producing under instruction from the controller the oscillating signal; and

the phase, frequency, and duty cycle adjustment circuit is further arranged for adjusting the duty cycle of the power signal by adjusting a duty cycle of the oscillating signal.

3. The bidirectional power transfer system of claim 1, further comprising a tuning network in wired data communication with the controller and in wired electrical communication with the power switching device via the at least one AC terminal, wherein the tuning network is arranged for adjusting under instruction from the controller the power signal to a tuned power signal.

4. The bidirectional power transfer system of claim 3, further comprising an amplitude/frequency/phase detector in wired data communication with the controller and in wired electrical communication with the tuning network wherein the

amplitude/frequency/phase detector is arranged to determine an amplitude, a frequency and a phase of any power signal communicated between the tuning network and an AC load/source external to the bidirectional power transfer system.

5. The bidirectional power transfer system of claim 4, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to adjust the oscillating signal based on measurement information received from the amplitude/frequency/phase detector one of directly and via the controller.

6. The bidirectional power transfer system of claim 4, wherein the tuning network comprises a voltage-current tuner for adjusting a phase difference between a voltage and a current of the tuned power signal based on measurement data from the amplitude/frequency/phase detector when the power switching device is in the amplifying condition.

7. The bidirectional power transfer system of claim 4, further comprising in wired data communication with the controller and in wired electrical communication between the power switching device and a DC power source/load external to the bidirectional power transfer system a power management circuit arranged for impedance matching the power switching device and the external DC power source/load and for adjusting DC power communicated between the power switching device and the DC power source/load based on measurement information received from the amplitude/frequency/phase detector one of directly and via the controller.

8. The bidirectional power transfer system of claim 7, further comprising in wired data communication with the controller a voltage/current-detector disposed to determine a DC voltage and DC current passed between the power switching device and the power management circuit.

9. The bidirectional power transfer system of claim 8, wherein the phase, frequency, and duty cycle adjustment circuit is arranged to adjust the oscillating signal based on a feedback signal received from the voltage/current-detector one of directly and via the controller.

10. The bidirectional power transfer system of claim 8, further comprising a memory in wired data communication with the controller, with the amplitude/frequency/phase detector, and with the voltage/current detector wherein the memory is arranged to receive and store data received from the two detectors and to provide data communication from the two detectors to the controller.

11. The bidirectional power transfer system of claim 4, wherein the tuning network further comprises one or more of a compensation network, a matching network, and a filter.

12. The bidirectional power transfer system of claim 3, comprising a modulator configured for modulating information onto at least one of the power signal and the DC voltage.

13. The bidirectional power transfer system of claim 12, wherein the modulator comprises at least one of the power switching device and the tuning network.

14. The bidirectional power transfer system of claim 4, wherein the AC load/source external to the bidirectional power transfer system comprises a transmitter-receiver resonator configured for:

resonating at the frequency of the power signal; and for

bimodal transferring of power.

15. The bidirectional power transfer system of claim 1, wherein bidirectional power transfer system is configured for modulating at least one of digital and analog information onto at least one of the DC voltage, the power signal, and a harmonic of the power signal.

16. The bidirectional power transfer system of claim 1, wherein all circuit elements of the system are monolithically integrated in a silicon single crystal wafer.

17. The bidirectional power transfer system of claim 1, wherein at least a portion of circuit elements of the system are integrated by microelectronic chip technology.

18. The bidirectional power transfer system of claim 4, wherein the AC load/source comprises a utility AC power grid.

19. The bidirectional power transfer system of claim 1, wherein the multiterminal power switching device comprises a differential switched-mode self-synchronous power amplifier/rectifier.

20. A bidirectional power transfer system comprising:

a multiterminal power switching device comprising at least one DC terminal, at least one AC terminal, and at least one control terminal, the multiterminal power switching device adjustable between an amplifying condition and a rectifying condition, and arranged for:

bidirectionally communicating via the at least one DC terminal a DC voltage and a DC current, and

bidirectionally communicating via the at least one AC terminal a power signal having an amplitude, a frequency, and a phase;

a controller arranged for:

establishing at the at least one control terminal of the power switching device an oscillating signal having the frequency and the phase of the power signal, and for

adjusting the power switching device between the amplifying condition and the rectifying condition by adjusting the phase of the oscillating signal;

an amplitude/frequency/phase detector in wired data communication with the controller and in wired electrical communication with the power switching device wherein the amplitude/frequency/phase detector is arranged to determine an amplitude, a frequency

and a phase of any power signal communicated between the power switching device and a utility AC power grid external to the bidirectional power transfer system; and

a phase, frequency, and duty cycle adjustment circuit in wired data communication with the controller and in wired electrical communication with the power switching device via the at least one control terminal.