Claims

1. A system (200, 300) for satellite communications, comprising:

a payload (230, 305) configured to utilize electrical energy at a first rate over a subinterval of an interval, the subinterval being associated with a level of demand for accessing the payload (230, 305) that exceeds a threshold, wherein thermal energy generated by the payload (230, 305) during the subinterval based at least in part on the electrical energy being utilized at the first rate exceeds a thermal processing capability of the payload (230, 305);

a power system (205) configured to generate electrical energy at a second rate over the interval and to supply electrical energy to the payload (230, 305) at the first rate over the subinterval, the first rate being larger than the second rate, wherein the second rate corresponds to an average electrical energy consumed by the payload (230, 305) over the interval, and wherein the power system (205) comprises an energy storage component (220) configured to supply at least a portion of the electrical energy supplied to the payload (230, 305) at the first rate over the subinterval; and

a thermal management component (290) configured to process a first portion of the thermal energy generated at the payload (230, 305) during the subinterval, wherein the first portion of the thermal energy generated at the payload (230, 305) is in excess of the thermal processing capability of the payload (230, 305), and wherein a second portion of the thermal energy generated at the payload (230, 305) during the subinterval is processed by the payload (230, 305) in accordance with the thermal processing capability of the payload (230, 305),

wherein the thermal management component (290) is further configured to:

store a first amount of the first portion of the thermal energy generated during the subinterval based at least in part on processing the first portion of the thermal energy generated at the payload (230, 305) during the subinterval, and

release, during a second subinterval of the interval, the first amount of the first portion of the thermal energy generated during the subinterval that was stored during the subinterval,

wherein the payload (230, 305) is configured to utilize electrical energy at a third rate over the second subinterval, the third rate being smaller than the second rate.

2. The system (200, 300) of claim 1, wherein the energy storage component (220) configured to:

store a first amount of electrical energy at a beginning of the subinterval; and

store a second amount of electrical energy that is less than the first amount of electrical energy at an end of the subinterval based at least in part on the first rate being greater than the second rate.

3. The system (200, 300) of any one of claims 1 or 2, wherein the subinterval corresponds to a period associated with the demand for accessing communication services provided by the payload (230, 305) that exceeds the threshold.

4. The system (200, 300) of claim 1, wherein the thermal management component (290) comprises:

a medium (315), wherein at least a portion of the medium (315) is configured to transition from a first phase to a second phase during the subinterval based at least in part on absorbing the first amount of the first portion of the thermal energy generated during the subinterval.

5. The system (200, 300) of claim 4, wherein a temperature of the thermal management component (290) is configured to remain within a range during a duration associated with the thermal management component (290) transitioning from the first phase to the second phase.

6. The system (200, 300) of any one of claims 4 or 5, wherein:

second thermal energy is generated by the payload (230, 305) during the second subinterval based at least in part on the electrical energy being utilized at the third rate, the second thermal energy generated during the second subinterval being within the thermal processing capability of the payload (230, 305); and

the power system (205) is configured to supply electrical energy to the payload (230, 305) at the third rate during the second subinterval.

7. The system (200, 300) of claim 6, wherein the first rate is based at least in part on second thermal energy released by the payload (230, 305) during the second subinterval.

8. The system (200, 300) of claim 6, wherein the energy storage component (220) of the power system (205) is configured to:

store a first amount of electrical energy at an end of the subinterval; and

store a second amount of electrical energy that is greater than the first amount of electrical energy at an end of the second subinterval based at least in part on the third rate being smaller than the second rate.

9. The system (200, 300) of claim 8, wherein the second subinterval corresponds to a period associated with the demand for accessing communication services provided by the payload (230) that is below the threshold.

10. The system (200, 300) of any one of claims 1 through 9, wherein the power system (205) comprises:

a solar array (215) configured to generate the electrical energy at the second rate over the interval.

11. The system (200, 300) of any one of claims 1 through 10, further comprising:

first transponders (231) that are associated with a first polarization for communications; and

second transponders that are associated with a second, orthogonal polarization for communications, wherein:

the payload (230, 305) is configured to activate both the first transponders (231) and the second transponders during the subinterval, and

the payload (230, 305) is configured to activate one of the first transponders or the second transponders during the second subinterval of the interval.

12. The system (200, 300) of any one of claims 1 through 10, further comprising:

first transponders (231) that are associated with first transmission beams that combine to serve a geographic area; and

second transponders that are associated with second transmission beams that combine to serve the geographic area, wherein:

the payload (230, 305) is configured to activate both the first transponders (231) and the second transponders during the subinterval, and

the payload (230, 305) is configured to activate one of the first transponders (231) or the second transponders during the second subinterval of the interval.

13. The system (200, 300) of any one of claims 1 through 10, further comprising:

a plurality of transponders (231), wherein:

a first set of signals from a first quantity of the plurality of transponders (231) are combined during the subinterval to form first transmission beams that serve a geographic area, and

a second set of signals from a second quantity of the plurality of transponders (231) are combined during the second subinterval of the interval to form second transmission beams that serve the geographic area, the first quantity being greater than the second quantity.

14. The system (200, 300) of any one of claims 1 through 13, further comprising:

amplifiers (235, 240, 245, 250) that are configurable to draw either a first amount of power or a second amount of power that is less than the first amount of power, wherein:

the amplifiers (235, 240, 245, 250) are configured to draw the first amount of power during the subinterval, and

the amplifiers (235, 240, 245, 250) are configured to draw the second amount of power during the second subinterval of the interval.

15. The system (200, 300) of any one of claims 1 through 13, further comprising:

first amplifiers (235, 245); and

second amplifiers (240, 250), wherein:

the payload (230, 305) is configured to activate both the first amplifiers (235, 245) and the second amplifiers (240, 250) during the subinterval, and

the payload (230, 305) is configured to activate one of the first amplifiers (235, 245) or the second amplifiers (240, 250) during the second subinterval of the interval.

16. The system (200, 300) of any one of claims 1 through 13, further comprising:

first amplifiers (235, 245) configured to draw a first amount of power; and

second amplifiers (240, 250) configured to draw a second amount of power that is less than the first amount of power, wherein:

the payload (230, 305) is configured to activate the first amplifiers (235, 245) and deactivate the second amplifiers (240, 250) during the subinterval, and

the payload (230, 305) is configured to deactivate the first amplifiers (235, 245) and activate the second amplifiers (240, 250) during the second subinterval of the interval.

17. A method for satellite communications, comprising:

utilizing, by a payload (230, 305), electrical energy at a first rate over a subinterval of an interval, the subinterval being associated with a level of demand for accessing the payload (230, 305) that exceeds a threshold, wherein thermal energy generated by the payload (230, 305) during the subinterval based at least in part on the electrical energy being utilized at the first rate exceeds a thermal processing capability of the payload (230, 305);

generating, by a power system (205), electrical energy at a second rate over the interval, wherein the second rate corresponds to an average electrical energy consumed by the payload (230, 305) over the interval;

supplying, by the power system (205), electrical energy to the payload (230, 305) at the first rate over the subinterval, the first rate being larger than the second rate,

wherein at least a portion of the electrical energy supplied to the payload (230, 305) at the first rate is supplied by an energy storage component (220) of the power system (205);

processing, at a thermal management component (290), a first portion of the thermal energy generated at the payload (230, 305) during the subinterval, wherein the first portion of the thermal energy generated at the payload (230, 305) is in excess of the thermal processing capability of the payload (230, 305), and wherein a second portion of the thermal energy generated at the payload (230, 305) during the subinterval is processed by the payload (230, 305) in accordance with the thermal processing capability of the payload (230, 305);

storing, by the thermal management component (290), a first amount of the first portion of the thermal energy generated during the subinterval based at least in part on processing the first portion of the thermal energy generated at the payload (230, 305) during the subinterval;

utilizing, by the payload (230, 305), electrical energy at a third rate over a second subinterval of the interval, the third rate being smaller than the second rate; and

releasing, by the thermal management component (290) during the second subinterval, the amount of the first portion of the thermal energy generated during the subinterval that was stored during the subinterval.

18. The method of claim 17, further comprising:

storing, by the power system (205), a first amount of electrical energy at a beginning of the subinterval and a second amount of electrical energy that is less than the first amount of electrical energy at an end of the subinterval based at least in part on the first rate being greater than the second rate.

19. The method of any one of claims 17 or 18, wherein the subinterval corresponds to a period associated with the demand for accessing communication services provided by the payload (230, 305) that exceeds the threshold.

20. The method of claim 17, wherein a medium of the thermal management component (290) transitions from a first phase to a second phase during the subinterval based at least in part on absorbing the first

amount of the first portion of the thermal energy generated during the subinterval.

21. The method of claim 20, wherein a temperature of the thermal management component (290) remains within a range during a duration associated with the thermal management component (290) transitioning from the first phase to the second phase.

22. The method of claim 21, wherein the range comprises a lower bound of 70 degrees Fahrenheit and an upper bound of 80 degrees Fahrenheit.

23. The method of any one of claims 17 through 22, wherein:

second thermal energy is generated by the payload (230, 305) during the second subinterval based at least in part on the electrical energy being utilized at the third rate, the second thermal energy generated during the second subinterval being within the thermal processing capability of the payload (230, 305); and

supplying, by the power system (205), electrical energy to the payload (230, 305) at the third rate during the second subinterval.

24. The method of claim 23, wherein the first rate is based at least in part on a second thermal energy released by the payload (230, 305) during the second subinterval.

25. The method of claim 23, further comprising:

storing, by the power system (205), a first amount of electrical energy at an end of the subinterval and storing a second amount of electrical energy that is greater than the first amount of electrical energy at an end of the second subinterval based at least in part on the third rate being smaller than the second rate.

26. The method of claim 23, wherein the second subinterval corresponds to a period associated with a demand for accessing communication services provided by the payload (230, 305) that is below the threshold.

27. The method of claim 17, wherein:

configuring the payload (230, 305) to support a first communications load comprises activating a first plurality of transponders (231) and a second plurality of transponders; and

configuring the payload (230, 305) to support a second communications load comprises deactivating the second plurality of transponders.

28. The method of claim 27, wherein the first plurality of transponders (231) is associated with a first polarization for communications and the second plurality of transponders is associated with a second, orthogonal polarization for communications.

29. The method of claim 27, wherein the first plurality of transponders (231) is associated with a first plurality of transmission beams that combine to serve a geographic area and the second plurality of transponders is associated with a second plurality of transmission beams that combine to serve the geographic area.

30. The method of any one of claims 17 through 29, wherein:

configuring the payload (230, 305) to support a first communications load comprises configuring a plurality of amplifiers (235, 240, 245, 250) to operate in a first mode, wherein the plurality of amplifiers draw a first amount of power in the first mode; and

configuring the payload (230, 305) to support a second communications load comprises configuring the plurality of amplifiers (235, 240, 245, 250) to operate in a second mode, wherein the plurality of amplifiers (235, 240, 245, 250) draw a second amount of power in the second mode, the first amount of power being greater than the second amount of power.

31. The method of any one of claims 17 through 29, wherein:

configuring the payload (230, 305) to support a first communications load comprises activating a first plurality of amplifiers (235, 245) and a second plurality of amplifiers (240, 250); and

configuring the payload (230, 305) to support a second communications load comprises deactivating the second plurality of amplifiers (240, 250).

32. The method of any one of claims 17 through 29, wherein:

configuring the payload (230, 305) to support a first communications load comprises activating a first plurality of amplifiers (235, 245); and

configuring the payload (230, 305) to support a second communications load comprises activating a second plurality of amplifiers (240, 250), wherein the second plurality of amplifiers (240, 250) draw smaller amount of power than the first plurality of amplifiers (235, 245).

33. The system (200, 300) of any one of claims 1 through 16, wherein the payload (230, 305) comprises components configured to support communications services provided by the payload (230, 305), and wherein the payload (230, 305) is further configured to:

configure the components to support a first communications load during the subinterval, wherein the payload (230, 305) is configured to utilize the electrical energy at the first rate based at least in part on the components being configured to support the first communications load, and

configure the components to support a second communications load during the second subinterval of the interval, wherein the payload (230, 305) is configured to utilize the electrical energy at the third rate based at least in part on the components being configured to support the second communications load, the first communications load being greater than the second communications load.

34. The system (200, 300) of any one of claims 1 through 16, wherein the energy storage component (220) is a battery (220).

35. The method of any one of claims 17 through 26, further comprising:

configuring the payload (230, 305) to support a first communications load during the subinterval, wherein the electrical energy is utilized at the first rate based at least in part on the payload (230, 305) being configured to support the first communications load; and

configuring the payload (230, 305) to support a second communications load during the second subinterval of the interval, wherein electrical energy is utilized by the payload (230, 305) at the third rate based at least in part on the payload (230, 305) being configured to support the second communications load, the first communications load being greater than the second communications load.