CLAIMS:

1. A diesel boiling-range fuel composition comprising:

at least about 50 wt% naphthenes;

less than about 1.5 wt% aromatics; and

about 10 wt% to about 50 wt% non-cyclic paraffins;

wherein the composition has a cetane number of at least about 50, measured according to ASTM D7668; and

wherein the composition satisfies one or more of the following:

(i) four-ring naphthenes are present in an amount of about 2.0% w/w to about 10% w/w relative to the total amount of naphthenes;

(ii) five-ring naphthenes are present in an amount of about 1.0% w/w to about 2.6% w/w relative to the total amount of naphthenes; and

(iii) six-ring naphthenes are present in an amount of about 0.20% w/w to about 1.0% w/w relative to the total amount of naphthenes.

2. The composition of claim 1, wherein the naphthenes are present in an amount of at least about 60 wt%.

3. The composition of claim 1, comprising about 10 wt% to about 50 wt% isoparaffins.

4. The composition of claim 1, wherein single ring naphthenes are present in an amount of at least about 50% w/w relative to a total amount of naphthenes.

5. The composition of claim 4, wherein a w/w ratio of the single ring naphthenes to the total naphthenes is about 2:5 to about 5:8.

6. The composition of claim 1, wherein multi-ring naphthenes are present in an amount of at least about 50% w/w relative to a total amount of naphthenes.

7. The composition of claim 6, wherein a w/w ratio of the multi-ring naphthenes to the total naphthenes is about 2:5 to about 5:8.

8. The composition of claim 1, wherein single ring naphthenes and multi-ring naphthenes are present in a w/w ratio of about 2:3 to about 3:2.

9. The composition of claim 6, wherein the multi-ring naphthenes are selected from the group consisting of two-ring naphthenes, three-ring naphthenes, four-ring naphthenes, five-ring naphthenes, six-ring naphthenes, and a combination thereof.

10. The composition of claim 9, wherein single ring naphthenes and two-ring naphthenes are present in a collective amount of at least about 60% w/w relative to the total amount of naphthenes.

11. The composition of claim 9, wherein four-ring naphthenes, five-ring naphthenes, and six-ring naphthenes are present in a collective amount of about 5.0% w/w to about 12% w/w relative to the total amount of naphthenes.

12. The composition of claim 1, wherein the composition satisfies at least two of (i)-(iii).

13. The composition of claim 1, wherein the composition satisfies (i)-(iii).

14. The composition of claim 1, wherein the composition comprises less than about 10 wt% of n-paraffins.

15. The composition of claim 1, wherein n-paraffins are present in an amount of less than about 20% w/w relative to a total amount of non-cyclic paraffins in the distillate composition.

16. The composition of claim 1, further comprising less than about 5 wppm sulfur.

17. The composition of claim 1, which exhibits at least one of the following properties:

(i) a cloud point of less than about -40°C;

(ii) a cold filter plugging point of less than about -20°C;

(iii) a smoke point of at least about 25 mm;

(iv) a change in viscosity of greater than about 0.400 cSt between about 100°C and about 200°C; and

(v) a volumetric energy content of at least about 131,000 BTU/gallon.

18. The composition of claim 17, which exhibits at least two of properties (i)-(v).

19. The composition of claim 17, which exhibits at least three of properties (i)-(v).

20. The composition of claim 17, which exhibits at least four of properties (i)-(v).

21. The composition of claim 17, which exhibits properties (i)-(v).