CLAIMS

What is claimed is:

1. A vacuum gas oil boiling range fraction comprising a T10 distillation point of 350°C or more, a T90 distillation point of 525°C or less, a density at 15°C of 890 kg/m^3 or less, a sulfur content of 0.3 wt% or less, a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, and a CCAI of 790 or less, wherein the vacuum gas oil boiling range fraction has not been exposed to hydroprocessing conditions..

2. The vacuum gas oil boiling range fraction of claim 1, wherein the vacuum gas oil boiling range fraction comprises a weight ratio of basic nitrogen to total nitrogen of 0.2 or more.

3. The vacuum gas oil boiling range fraction of claim 1, wherein the vacuum gas oil boiling range fraction comprises a kinematic viscosity at 50°C of 45 cSt or less, or wherein the vacuum gas oil boiling range fraction comprises a viscosity index of 80 or more, or a combination thereof.

4. The vacuum gas oil boiling range fraction of claim 1, wherein the vacuum gas oil boiling range fraction comprises a weight ratio of naphthenes to aromatics of 1.0 or more.

5. The vacuum gas oil boiling range fraction of claim 1, wherein the vacuum gas oil boiling range fraction comprises 40 wt% or more of naphthenes.

6. The vacuum gas oil boiling range fraction of claim 1, wherein the vacuum gas oil boiling range fraction comprises a nitrogen content of 950 wppm or less, or wherein the vacuum gas oil boiling range fraction comprises a pour point of 20°C or more, or a combination thereof.

7. The vacuum gas oil boiling range fraction of claim 1, wherein the vacuum gas oil boiling range composition is used as a fuel in an engine, a furnace, a burner, a combustion device, or a combination thereof.

8. A fuel composition comprising 10 vol% to 45 vol% of a distillate fraction and 55 vol% to 90 vol% of an vacuum gas oil fraction, wherein the vacuum gas oil fraction comprises a T90 distillation point of 525°C or less, a density at 15°C of 890 kg/m^3 or less, a sulfur content of 0.3 wt% or less, and a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, wherein the vacuum gas oil fraction has not been exposed to hydroprocessing conditions.

9. The fuel composition of claim 8, wherein the vacuum gas oil fraction comprises a kinematic viscosity at 50°C of 15 cSt or more, a CCAI of 790 or less, or a combination thereof.

10. The fuel composition of claim 8, wherein the distillate fraction comprises a renewable distillate fraction.

11. The fuel composition of claim 8, wherein the renewable distillate fraction comprises one or more of biodiesel, fatty acid alkyl ester, and hydrotreated vegetable oil; or wherein the

renewable distillate comprises a distillate made, processed or a combination thereof using a renewable energy source; or wherein the renewable distillate comprises a distillate formed from processing of biologically derived waste, or a combination thereof.

12. The fuel composition of claim 8, wherein the fuel composition comprises a pour point of 30°C or less.

13. The fuel composition of claim 8, wherein the vacuum gas oil fraction comprises a naphthenes to aromatics ratio of 1.0 or more, or wherein the vacuum gas oil fraction comprises 40 wt% or more of naphthenes, or a combination thereof.

14. The fuel composition of claim 8, wherein the fuel composition is used as a fuel in an engine, a furnace, a burner, a combustion device, or a combination thereof.

15. A method for forming a fuel composition, comprising:

fractionating a whole crude or crude fraction to form a vacuum gas oil fraction comprising a T10 distillation point of 350°C or more, a T90 distillation point of 525°C or less, a density at 15°C of 890 kg/m^3 or less, a sulfur content of 0.3 wt% or less, a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, and a CCAI of 790 or less, wherein the vacuum gas oil fraction has not been exposed to hydoprocessing conditions.

16. The method of claim 15, further comprising blending 10 vol% to 50 vol% of a resid-containing fraction with 50 vol% to 90 vol% of the vacuum gas oil fraction to form a blended fuel oil composition comprising a sulfur content of 0.5 wt% or less.

17. The method of claim 15, further comprising blending 10 vol% to 45 vol% of a distillate fraction with 55 vol% to 90 vol% of the vacuum gas oil fraction to form a blended fuel composition comprising a sulfur content of 0.5 wt% or less.

18. The method of claim 17, wherein the distillate fraction comprises a renewable distillate fraction.

19. The method of claim 17, wherein the blended fuel composition comprises a pour point of 30°C or less.

20. A vacuum resid boiling range fraction comprising a T10 distillation point of 500°C or more, a density at 15°C of 950 kg/m^3 or less, a sulfur content of 0.4 wt% or less, a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, and a CCAI of 790 or less, wherein the vacuum resid boiling range fraction has not been exposed to hydroprocessing conditions.

21. The vacuum resid boiling range fraction of claim 20 including a weight ratio of naphthenes to aromatics of 0.35 or more, 24 wt% or more of naphthenes, or a combination thereof.

22. The vacuum resid boiling range fraction of 20 including 2.0 wppm or more of sodium, 5 wppm or more of calcium, a weight ratio of basic nitrogen to total nitrogen of 0.2 or more, or a combination thereof.

23. A fuel composition comprising:

25 vol% to 75 vol% of a vacuum resid fraction and 25 vol% to 75 vol% of a distillate fraction, a cracked distillate fraction, or a combination thereof,

wherein the fuel composition comprises a density at 15°C of 950 kg/m^3 or less, a sulfur content of 0.5 wt% or less, a CCAI of 820 or less, and a pour point of 30°C or less, and

wherein the vacuum resid fraction comprises a density at 15°C of 950 kg/m^3 or less, a sulfur content of 0.4 wt% or less, a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, and a CCAI of 790 or less, wherein the vacuum resid fraction has not been exposed to hyroprocessing conditions.

24. The fuel composition of claim 23, wherein the vacuum resid fraction comprises a weight ratio of naphthenes to aromatics of 0.35 or more, or wherein the vacuum resid fraction comprises 24 wt% or more of naphthenes, or a combination thereof.

25. The fuel composition of claim 23, wherein the fuel composition comprises a sulfur content of 0.1 wt% or less, or wherein the vacuum resid fraction comprises a sulfur content of 0.1 wt% or less, or a combination thereof.

26. The fuel composition of claim 23, wherein the fuel composition comprises a pour point of 30°C or less.

27. The fuel composition of claim 23, wherein the distillate fraction comprises a renewable distillate fraction, the fuel composition comprising 25 vol% to 70 vol% of the renewable distillate fraction and 30 vol% to 75 vol% of the vacuum resid fraction.

28. The fuel composition of claim 23, wherein the vacuum resid fraction comprises 2.0 wppm or more of sodium, 5 wppm or more of calcium, a weight ratio of basic nitrogen to total nitrogen of 0.2 or more, or a combination thereof.

29. The fuel composition of claim 23, wherein the fuel composition is used as a fuel in an engine, a furnace, a burner, a combustion device, or a combination thereof.

30. A method for forming a residual fuel or fuel blending product comprising:

blending 25 vol% to 75 vol% of a vacuum resid fraction and 25 vol% to 75 vol% of a distillate fraction, a cracked distillate fraction, or a combination thereof,

wherein the fuel composition comprises a density at 15°C of 950 kg/m^3 or less, a sulfur content of 0.5 wt% or less, a CCAI of 820 or less, and a pour point of 30°C or less, and

wherein the vacuum resid fraction comprises a density at 15°C of 950 kg/m^3 or less, a sulfur content of 0.35 wt% or less, a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, and a CCAI of 780 or less, wherein the vacuum resid fraction has not been exposed to hydroporcessing conditions.

31. The method of claim 30, wherein the distillate fraction comprises a renewable distillate fraction, and wherein the fuel composition comprises 25 vol% to 70 vol% of the renewable distillate fraction and 30 vol% to 75 vol% of the vacuum resid fraction.

32. A marine fuel composition comprising a T10 distillation point of 150°C to 230°C, a T90 distillation point of 350°C to 425°C, a kinematic viscosity at 40°C of 2.0 cSt to 4.0 cSt, a sulfur content of 0.07 wt% or less, a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, and a cetane index of 45 or more, wherein the marine fuel composition has not been exposed to hydroprocessing conditions.

33. The marine fuel composition of claim 32, wherein the marine fuel composition comprises a flash point of 60°C or more, a density at 15°C of 810 kg/m^3 to 835 kg/m^3, a kinematic viscosity at 40°C of 2.5 cSt to 3.2 cSt, or a combination thereof.

34. The marine fuel composition of claim 32, wherein the marine fuel composition comprises a weight ratio of naphthenes to aromatics of 2.5 or more, a naphthenes content of 40 wt% or more, or a combination thereof.

35. The marine fuel composition of claim 32, wherein the marine fuel composition comprises a nitrogen content of 200 wppm or less; or wherein the marine fuel composition comprises an acid number of 0.02 to 0.07 mg KOH /g; or wherein the marine fuel composition comprises a pour point of 0°C or less; or a combination thereof.

36. The marine fuel composition of claim 32, wherein the marine fuel composition is used as a fuel in an engine, a furnace, a burner, a combustion device, or a combination thereof

37. A method for forming a fuel composition, comprising:

fractionating a whole crude or crude fraction to form a fraction comprising a T10 distillation point of 150°C to 230°C, a T90 distillation point of 350°C to 425°C, a kinematic viscosity at 40°C of 2.0 cSt to 4.0 cSt, a sulfur content of 0.07 wt% or less, a weight ratio of aliphatic sulfur to total sulfur of 0.2 or more, and a cetane index of 49 or more, wherein the fuel composition has not been exposed to hydroprocessing conditions.