CLAIMS:

1. A naphtha boiling range spark ignition engine fuel composition having a T5 distillation point of 10°C or more, a T95 distillation point of 193°C or less, and a research octane number (RON) of 80 to 101, the fuel composition comprising paraffins, isoparaffins, naphthenes, and aromatics, the fuel composition further comprising a combined wt% of n-paraffins and isoparaffins that include a straight-chain propyl group that is less than (-1.273 x RON + 135.6) based on the total weight of the fuel composition.

2. The fuel composition of claim 1, wherein the fuel composition has a RON of 80 to 99, or 88 to 101.

3. The fuel composition of claim 1, wherein a sensitivity (RON – MON) of the fuel composition is about 8.0 about 18.0.

4. The fuel composition of claim 1, wherein the fuel composition further comprises oxygenates, or wherein the fuel composition further comprises olefins, or a combination thereof.

5. A method for making a modified naphtha boiling range spark ignition engine fuel composition comprising:

forming a modified naphtha boiling range composition by adding a modifier composition to a first naphtha boiling range composition, the modifier composition comprising one or more compounds different from n-paraffins and isoparaffins that include a straight chain n-propyl group,

the first naphtha boiling range composition comprising paraffins, isoparaffins, naphthenes, and aromcatics,

the first naphtha boiling range composition having a T5 distillation point of 10°C or more, a T95 distillation point of 193°C or less, and a research octane number (RON) of at least 80,

the modified naphtha boiling range composition comprising paraffins, isoparaffins, naphthenes, and aromcatics, the modified naphtha boiling range composition having a T5 distillation point of 10°C or more, a T95 distillation point of 193°C or less, and a RON of 80 to 101, wherein:

an ignition delay of the modified naphtha boiling range composition is greater than an ignition delay of the first naphtha boiling range composition by at least 1.0 milliseconds , and

a combined wt% of n-paraffins and isoparaffins that include a straight-chain propyl group in the modified naphtha boiling range composition is less than (-1.273 x RON + 135.6) based on a total weight of the modified naphtha boiling range composition.

6. The method of claim 5, wherein the RON of the modified naphtha boiling range composition differs from the RON of the first naphtha boiling range composition by 5.0 or less.

7. The method of claim 5, wherein the first naphtha boiling range composition has a RON of about 80 to about 99; or wherein the modified naphtha boiling range composition has a RON of about 80 to about 99; or a combination thereof.

8. The method of claim 5, wherein the modified naphtha boiling range composition has a RON of about 88 to about 101; or wherein the first naphtha boiling range composition has a RON of about 88 to about 101; or a combination thereof.

9. The method of claim 5, wherein the ignition delay is defined as an initial local maximum in the dP / dt curve generated during constant volume combustion at 596°C according to the method described in ASTM D7668.

10. The method of claim 5, wherein the modifier composition comprises one or more aromatics, one or more naphthenes, or a combination thereof.

11. A naphtha boiling range spark ignition engine fuel composition having a T5 distillation point of 10°C or more, a T95 distillation point of 193°C or less, and a research octane number (RON) of about 80 to about 101, the fuel composition comprising paraffins, isoparaffins, naphthenes, and aromatics, the fuel composition further comprising a combined wt % of n-paraffins and isoparaffins that include a straight-chain propyl group that, based on the total weight of the fuel composition, is less than the value from Expression 1 for the corresponding RON value of the fuel composition, wherein

Expression 1 has the form:

RON Range	C_{3+} wt% (straight-chain propyl in n-paraffin and isoparaffin)
88.3 <= RON <= 91.4	C_{3+} wt% < 411.1 – 4.290 x RON (wt% 32.3 - 19.0)
91.4 <= RON <= 96.4	C_{3+} wt% < 73.8 – 0.600 x RON (wt% 19.0 – 16.0)
96.4 <= RON <= 97.9	C_{3+} wt% < 350.2 – 3.467 x RON (wt% 16.0 – 10.8)
97.9 <= RON <= 99.5	C_{3+} wt% < -32.00 + 0.4375 x RON (wt% 10.8 – 11.5)
99.5 <= RON <= 101.1	C_{3+} wt% < 167.0 – 1.563 x RON (wt% 11.5 – 9.0).

12. The fuel composition of claim 11, wherein the fuel composition has a RON of 80 to 99, or wherein the fuel composition has a RON of 88 to 101.

13. The fuel composition of claim 11, wherein a sensitivity (RON-MON) of the fuel composition is about 8.0 to about 18.0.

14. The fuel composition of claim 11, wherein the fuel composition further comprises oxygenates, or wherein the fuel composition further comprises olefins, or a combination thereof.