CLAIMS:

What is claimed is:

1. A hydrocarbon upgrading process, comprising:

(I) feeding molecular hydrogen, a utility fluid, and a hydrocarbon feed comprising a Group I lube extract into a first hydroprocessing stage;

(II) conducting hydroprocessing in the first hydroprocessing stage to produce a first hydroprocessed effluent;

(III) separating from the first hydroprocessed effluent a mid-cut product and a bottoms product;

(IV) feeding molecular hydrogen and at least a portion of the bottoms product into a second hydroprocessing stage;

(V) conducting hydroprocessing in the second hydroprocessing stage to produce a second hydroprocessed effluent; and

(VI) recycling at least a portion of the mid-cut product to the first hydroprocessing stage as at least a portion of the utility fluid.

2. The process of claim 1, wherein the mid-cut product comprises ≤ 0.5 wt% of sulfur and 8.7 wt% to 11 wt% of hydrogen based on a total weight of the mid-cut product, has an API gravity in a range from 8° to 14°, an SBN in a range from 100 to 140, and a density in a range from 0.871 g/cm^3 to 1.065 g/cm^3.

3. The process of claim 1, wherein the Group I lube extract comprises 3.5 wt% to 6 wt% of sulfur and 8 wt% to 12 wt% of hydrogen based on a total weight of the Group I lube extract, has an API gravity in a range from 7.3° to 10°, an SBN in a range from 93 to 155, and a density in a range from 0.905 g/cm^3 to 1.113 g/cm^3.

4. The process of claim 1, wherein the hydrocarbon feed in step (I) further comprises a steam cracker tar, wherein the steam cracker tar comprises 3.3 wt% to 5 wt% of sulfur and 5.5 wt% to 7.5 wt% of hydrogen based on a total weight of the steam cracker tar, has an API gravity in a range from -11° to -8°, an SBN in a range from 180 to 250, and a density in a range from 1.040 g/cm^3 to 1.271 g/cm^3.

5. The process of claim 4, further comprising:

providing a particle-containing steam cracker tar comprising solid particles therein; and removing at least a portion of the solid particles from the particle-containing steam cracker tar to obtain the steam cracker tar; and

wherein the first hydroprocessing stage comprises, in sequence, a guard bed reactor, a pre-treater downstream of the guard bed reactor, and a main first hydroprocessing reactor downstream of the pre-treater.

6. The process of claim 1, wherein the hydrocarbon feed in step (I) further comprises a fluidized catalytic cracker main column bottoms product, wherein the fluidized catalytic cracker main column bottoms product comprises 1.5 wt% to 5 wt% of sulfur and 6.1 wt% to 8.8 wt% of hydrogen based on a total weight of the fluidized catalytic cracker main column bottoms product, has an API gravity in a range from -11° to 2.5°, an SBN in a range from 180 to 250, and a density in a range from 0.954 g/cm^3 to 1.243 g/cm^3.

7. The process of claim 1, wherein the hydrocarbon feed in step (I) consists essentially of the Group I lube extract.

8. The process of claim 1, wherein the hydroprocessing in step (V) is conducted at a higher temperature than the hydroprocessing in step (II); and

wherein the hydroprocessing in step (II) is conducted at a greater weight hourly space velocity than the hydroprocessing in step (V).

9. The process of claim 1, wherein step (III) further comprises separating an overhead product comprising molecular hydrogen from the first hydroprocessed effluent, and wherein at least a portion of the molecular hydrogen separated in step (III) is recycled to step (I), fed into the second hydroprocessing stage in step (IV), or a combination thereof.

10. The process of claim 1, wherein step (III) further comprises separating from the first hydroprocessed effluent a light cut comprising naphtha.

11. A hydrocarbon upgrading process, comprising:

(I) heating a hydrocarbon in a steam cracking furnace and combining the hydrocarbon with an aqueous fluid to produce a first mixture comprising hydrocarbon and steam, wherein the heating is carried out before, during, and/or after the hydrocarbon feed is combined with the aqueous fluid;

(II) steam cracking at least a portion of the first mixture to produce a steam cracker effluent;

(III) separating from the steam cracker effluent a steam cracker tar product and an upgraded steam cracker effluent comprising ethylene and propylene;

(IV) feeding molecular hydrogen, at least a portion of the steam cracker tar product, and a hydrocarbon feed comprising a Group I lube extract into a first hydroprocessing stage;

(V) conducting hydroprocessing in the first hydroprocessing stage to produce a first hydroprocessed effluent;

(VI) separating from the first hydroprocessed effluent a mid-cut product and a bottoms product;

(VII) feeding molecular hydrogen and at least a portion of the bottoms product into a second hydroprocessing stage;

(VIII) conducting hydroprocessing in the second hydroprocessing stage to produce a second hydroprocessed effluent; and

(IX) recycling at least a portion of the mid-cut product to the first hydroprocessing stage as at least a portion of the utility fluid.

12. The process of claim 11, wherein the Group I lube extract comprises 3.5 wt% to 6 wt% of sulfur and 8 wt% to 12 wt% of hydrogen based on a total weight of the Group I lube extract, and has an API gravity in a range from 7.3° to 10°, an SBN in a range from 93 to 155, and a density in a range from 0.905 g/cm^3 to 1.113 g/cm^3;

wherein the mid-cut product comprises ≤ 0.5 wt% sulfur and 8.7 wt% to 11 wt% of hydrogen based on a total weight of the mid-cut product, has an API gravity in a range from 8° to 14°, an SBN in a range from 100 to 140, and a density in a range from 0.871 g/cm^3 to 1.065 g/cm^3; and

wherein the steam cracker tar comprises 3.3 wt% to 5 wt% of sulfur and 5.5 wt% to 7.5 wt% of hydrogen based on a total weight of the steam cracker tar, has an API gravity in a range

from -11° to -8°, an SBN in a range from 180 to 250, and a density in a range from 1.040 g/cm^3 to 1.271 g/cm^3.

13. The process of claim 11, further comprising:

(I_a) separating from the first mixture a vapor phase product and a liquid phase product, wherein at least a portion of the vapor phase product is steam cracked in step (II) to produce the steam cracker effluent;

(X) catalytically cracking at least a portion of the liquid phase product in a fluidized catalytic cracker to produce a fluidized catalytic cracker effluent; and

(XI) separating the fluidized catalytic cracker main column bottoms product from the fluidized catalytic cracker effluent, wherein at least a portion of the separated fluidized catalytic cracker main column bottoms is fed into the first hydroprocessing stage in step (IV);

wherein step (IV) further comprises feeding a fluidized catalytic cracker main column bottoms product with the at least a portion of the steam cracker tar product, the utility fluid, and the hydrocarbon feed into the first hydroprocessing stage; and

wherein the fluidized catalytic cracker main column bottoms product comprises 1.5 wt% to 5 wt% of sulfur and 6.1 wt% to 8.8 wt% of hydrogen based on a total weight of the fluidized catalytic cracker main column bottoms product, has an API gravity in a range from -11° to 2.5°, an SBN in a range from 180 to 250, and a density in a range from 0.954 g/cm^3 to 1.243 g/cm^3.

14. The process of claim 11, wherein the hydroprocessing in step (VIII) is conducted at a higher temperature than the hydroprocessing in step (V); and

wherein the hydroprocessing in step (V) is conducted at a greater weight hourly space velocity than the hydroprocessing in step (VIII).

15. The process of claim 11, further comprising (IV_a) combining the at least a portion of the steam cracker tar product with the utility fluid and the hydrocarbon feed to produce a second mixture, wherein the second mixture is fed into the first hydroprocessing stage; and

wherein step (VI) further comprises separating an overhead product comprising molecular hydrogen from the first hydroprocessed effluent, and wherein at least a portion of the molecular hydrogen separated in step (VI) is recycled to step (IV), fed into the second hydroprocessing stage in step (VII), or a combination thereof.