CLAIMS

1. A process for generating electric power, the process comprising:

combining a supercritical water stream with a pressurized, heated hydrocarbon-based composition in a mixing device to create a combined feed stream;

introducing the combined feed stream into a supercritical reactor, in which the supercritical reactor operates at a temperature greater than a critical temperature of water and a pressure greater than a critical pressure of water, to produce an upgraded product;

depressurizing the upgraded product;

separating the upgraded product into at least one light liquid fraction and at least one heavy liquid fraction, in which hydrocarbons in the light liquid fraction have an American Petroleum Institute (API) gravity value that is greater than hydrocarbons in the heavy liquid fraction; and

introducing at least a portion of the heavy liquid fraction to a boiler to generate electric power, introducing at least a portion of the light liquid fraction to a gas turbine to generate electric power, or both.

2. The process of claim 1, in which the hydrocarbons in the light liquid fraction have an API gravity value of greater than or equal to 30° and the hydrocarbons in the heavy liquid fraction have an API gravity value of less than 30°.

3. The process of any previous claim, further comprising:

passing the light liquid fraction to an oil/gas/water separator to produce a gas fraction, a liquid oil fraction, and a water fraction; and

passing the water fraction to a water treatment unit to produce a feed water fraction.

4. The process of claim 3, in which the liquid oil fraction has a metal content of less than 10 weight parts per million (wt ppm) metal.

5. The process of claim 3, in which the liquid oil fraction, the gas fraction, or both, are passed to a turbine system to generate power, in which the turbine system comprises a combustor and a gas turbine.

6. The process of any previous claim, further comprising:

passing the at least one heavy liquid fraction to an oil-water separator to separate at least some water from the heavy liquid fraction to produce a dewatered heavy fraction;

passing the second water fraction to the water treatment unit to produce a second feed water fraction; and

introducing the first feed water fraction, the second feed water fraction, or both to the boiler, in which:

the dewatered heavy fraction has a water content of less than or equal to 1 wt% water; and

the dewatered heavy fraction has a viscosity of less than or equal to 380 centistokes (cSt) at 122°F.

7. The process of any previous claim, in which separating the upgraded product comprises passing the upgraded product to at least one distillation unit.

8. The process of any previous claim, further comprising passing steam from the boiler and heating the heated, pressurized hydrocarbon-based composition, the supercritical water stream, or both.

9. A process for generating electric power, the process comprising:

combining a supercritical water stream with a pressurized, heated hydrocarbon-based composition in a mixing device to create a combined feed stream;

introducing the combined feed stream into a supercritical reactor, where the supercritical reactor operates at a temperature greater than a critical temperature of water and a pressure greater than a critical pressure of water;

depressurizing the upgraded product;

separating the upgraded product in at least one gas/oil/water separator to produce at least a gas fraction, a liquid oil fraction, and a water fraction;

separating the liquid oil fraction in a distillation unit to produce at least a light oil fraction, a cutterstock fraction, and a heavy oil fraction;

combining at least cutterstock fraction and the heavy oil fraction to produce a fuel oil fraction; and

passing the light oil fraction to a gas turbine system to generate electric power,

passing the fuel oil fraction to a boiler to generate electric power, or both.

10. The process of claim 9, in which:

hydrocarbons in the light oil fraction have an API gravity value of greater than or equal to 30°;

the hydrocarbons in the heavy oil fraction have an API gravity value of less than 30°; and

the liquid oil fraction has a metal content of less than 10 weight parts per million (wt ppm) metal.

11. The process of any of claims 9 or 10, further comprising passing the water fraction to a water treatment unit to produce a first feed water fraction.

12. The process of any of claims 9-11, further comprising:

passing the at least one heavy oil fraction to an oil-water separator to separate at least some water from the heavy oil fraction to produce a dewatered heavy fraction and a second water fraction;

passing the second water fraction to the water treatment unit to produce a second feed water fraction; and

introducing the first feed water fraction, the second feed water fraction, or both to the boiler, in which:

the dewatered heavy fraction has a water content of less than or equal to 1 wt% water; and

the dewatered heavy fraction has a viscosity of less than or equal to 380 cSt at 122°F.

13. The process of any of claims 9-12, in which separating the upgraded product comprises passing the upgraded product to at least one distillation unit.

14. The process of any of claims 9-13, further comprising:

passing steam from the boiler to at least one pre-heater;

introducing steam from the boiler to the supercritical upgrading reactor; or both.

15. The process of any of claims 9-14, further comprising passing the gas fraction to the gas turbine system to generate electric power.