CLAIMS

What is claimed:

1. A reactor for cracking a hydrocarbon feed, comprising:

   a heater chamber defining a reaction section of an electric heater;

   independently controlled coils extending from a feed inlet through the reaction section;

   electrical heating elements disposed within the heater chamber, wherein the electrical heating elements are electrically powered and disposed around the independently controlled coils;

   a control system configured to selectively heat different sections of the independently controlled coils to selected temperatures using the electrical heating elements; and

   a primary exchanger comprising an inlet fluidly connected to the independently controlled coils and an effluent outlet.

2. The reactor of claim 1, further comprising a secondary exchanger having an inlet fluidly connected to the effluent outlet of the primary exchanger.

3. The reactor of claim 1 or 2, wherein the primary exchanger further comprises a steam outlet and a steam flow line directed to the feed inlet.

4. The reactor of claim 1 or 2, further comprising a preheating section spaced apart from the reaction section and downstream of the feed inlet, wherein the preheating section comprises at least one exchanger.

5. The reactor of claim 1 or 2, wherein the feed inlet is fluidly connected to multiple feed sources, and wherein a valve is positioned along a flow line from each of the multiple feed sources to the independently controlled coils.

6. A method of thermally cracking a hydrocarbon feed, comprising:

   feeding the hydrocarbon feed into independently controlled coils in a reaction section of an electric heater;

   using electrical energy to heat the hydrocarbon feed in the electric heater to a reaction temperature;

   directing a reaction output from the electric heater to at least one exchanger to cool the reaction output; and

   selectively heating different sections of the independently controlled coils to selected temperatures using multiple electrical heating elements disposed around the independently controlled coils in the electric heater.

7. The method of claim 6, further comprising recovering heat from the reaction output using the at least one exchanger and using the recovered heat to preheat the hydrocarbon feed prior to feeding the hydrocarbon feeds into the electric heater.
8. The method of claim 6 or 7, further comprising feeding multiple different types of feeds to different coils in the reaction section and collectively separating the reaction outputs from the multiple feeds.
9. The method of claim 6 or 7, further comprising feeding a second hydrocarbon feed into the electric heater, the second hydrocarbon feed having a different composition than the hydrocarbon feed.
10. The method of claim 6 or 7, further comprising:
    using a valve to isolate one of the independently controlled coils; and
    decoking the isolated coil.
11. A method, comprising:
    designing a thermal cracking plant comprising:
        an electric heater for thermally cracking a feed, the electric heater consuming an amount of power required to thermally crack the feed, wherein the electric heater comprises:
            a heater chamber defining a reaction section of the electric heater;
            independently controlled coils extending from a feed inlet through the reaction section;
            a plurality of electrical heating elements disposed around the independently controlled coils within the heater chamber, wherein the electrical heating elements are electrically powered; and
        a control system configured to selectively heat different sections of individual coils to selected temperatures using the plurality of electrical heating elements; and
        a recovery section comprising a primary exchanger comprising an inlet fluidly connected to the independently controlled coils and an effluent outlet;
    determining an amount of steam generated and an amount of steam consumed by the thermal cracking plant;
    determining the amount of power used by the thermal cracking plant, including power from electrically powering the electrical heating elements, to thermally crack the feed; and

adjusting at least one parameter of the thermal cracking plant to reduce the amount of power used by the thermal cracking plant.

12. The method of claim 11, wherein adjusting the at least one parameter comprises lowering a cross over temperature of the feed to the electric heater.
13. The method of claim 12, further comprising designing the electric heater to have at least one additional coil to lower the cross over temperature of the feed.
14. The method of any of claims 11 to 13, wherein the thermal cracking plant further comprises a preheating section, and wherein adjusting the at least one parameter comprises increasing an outlet temperature from the recovery section, reducing the amount of steam consumed by the recovery section, and increasing the amount of steam consumed by the preheating section.