CLAIMS:

1. A method for performing an endothermic reaction, comprising: exposing an oxygen-containing stream to an oxygen storage component in a combustion zone within a reactor to form an oxidized oxygen storage component, the reactor optionally comprising a reverse flow reactor, the oxygen storage component comprising: a metal oxide system comprising manganese oxide, iron oxide, copper oxide, nickel oxide, or a combination thereof, and a binder comprising magnesium oxide, calcium oxide, yttrium oxide or a combination thereof; reacting a fuel mixture comprising a fuel stream and a working fluid with the oxidized oxygen storage component under combustion conditions to form a flue gas and to heat one or more surfaces in a reaction zone to a regenerated surface temperature of 600°C or more, the fuel mixture comprising 20 vol% or more CO_2; recycling at least a portion of the flue gas to form at least a portion of the working fluid; and exposing an endothermic reagent stream to the one or more surfaces in the reaction zone at the regenerated surface temperature to form an endothermic product stream, a direction of flow for the endothermic reagent stream within the reaction zone being reversed relative to a direction of flow for the fuel mixture.

2. The method of claim 1, wherein the oxygen storage component comprises 20 wt% to 80 wt% of the binder, relative to a weight of the oxygen storage component.

3. The method of any of the above claims, wherein the endothermic reagent stream comprises H_2O and the endothermic product stream comprises H_2O at a higher temperature than a temperature of the endothermic reagent stream.

4. The method of any of the above claims, wherein the endothermic product stream comprises an endothermic reaction product stream.

5. The method of any of the above claims, wherein the one or more surfaces comprise a catalyst composition.

6. The method of any of the above claims, wherein at least a portion of the one or more surfaces are in the combustion zone.

7. The method of any of the above claims, wherein the endothermic reagent stream comprises a hydrocarbon, the endothermic product stream comprising a reforming effluent.

8. The method of claim 7, further comprising: exposing the reforming effluent to water gas shift reaction conditions to form a shifted synthesis gas product stream; and separating the shifted synthesis gas product stream by pressure swing adsorption to form a H_2-containing stream and a

stream comprising CO_2, the fuel mixture optionally comprising at least a portion of the stream comprising CO_2.

9. The method of any of the above claims, wherein recycling at least a portion of the flue gas to form at least a portion of the working fluid comprises separating the flue gas to form at least a CO_2-containing stream and the at least a portion of the working fluid.

10. The method of any of the above claims, wherein the combustion conditions comprise a combustion pressure of 0.5 MPa-g to 7.0 MPa-g, the oxygen storage conditions optionally comprising an oxygen storage pressure that differs from the combustion pressure by 3.0 MPa or less.

11. The method of any of the above claims, the method further comprising exposing the oxygen storage component to a supplemental oxygen-containing stream after the reacting of the fuel mixture and prior to the exposing of the one or more surfaces to the endothermic reagent.

12. The method of any of the above claims, wherein exposing the oxygen-containing stream to the oxygen storage component comprises exposing air to the oxygen storage component to form a depleted air stream, the method further comprising passing the depleted air stream into a combustion zone of a turbine, the depleted air stream optionally comprising 12 vol% to 16 vol% O_2.

13. The method of any of the above claims, wherein the working fluid comprises 25 vol% or more CO_2.

~~14. A reverse flow reactor system comprising: a reactor comprising a reactor inlet end, a regenerator inlet end, and a regeneration zone comprising an oxygen storage component, the oxygen storage component comprising: a metal oxide system comprising manganese oxide, iron oxide, copper oxide, nickel oxide, or a combination thereof, and a binder comprising magnesium oxide, calcium oxide, yttrium oxide or a combination thereof; and a recycle loop providing intermittent fluid communication between the reactor inlet end and the regenerator inlet, the recycle loop comprising a recycle compressor, a fuel source inlet, an oxygen-containing gas inlet, and a CO_2-containing gas outlet.~~

~~15. The reverse flow reactor system of claim 14, wherein the oxygen storage component comprises 20 wt% to 80 wt% of the binder, relative to a weight of the oxygen storage component.~~