CLAIMS:

~~What is claimed is:~~

~~1. An element in a molten carbonate fuel cell stack, comprising: a gas flow inlet; a first volume in fluid communication with the gas flow inlet; a second volume comprising at least a portion of an anode active area of a fuel cell anode, at least a portion of a cathode active area of a fuel cell cathode, or reforming catalyst, the second volume being in fluid communication with the gas flow inlet via the first volume;~~

1. A fuel cell stack, comprising:

a cathode input manifold adjacent to a cathode input side of the fuel cell stack;

an anode input manifold adjacent to an anode input side of the fuel cell stack that is different from the cathode input side;

a cathode output manifold adjacent to a cathode output side of the fuel cell stack that is different from the cathode input side and the anode input side;

a fuel cell comprising:

an anode comprising an anode inlet located on the anode inlet side of the fuel cell stack, an extended edge seal input chamber, and an anode active area, the anode inlet being in fluid communication with the anode input manifold, the extended edge seal input chamber being located on the cathode input side or the cathode output side, and the extended edge seal input chamber being in fluid communication with the anode input and the anode active area through an anode active area inlet, wherein the anode active area inlet is located on the cathode input side or the cathode output side;

a cathode comprising a cathode inlet and a cathode active area, the cathode inlet being substantially parallel to the anode inlet;

an electrolyte matrix layer separating the anode and the cathode; and

- an inlet baffle located adjacent to the anode active area inlet, the inlet baffle comprising a plurality of inlet baffle apertures at an inlet boundary between the ~~first volume~~ extended edge seal input chamber and the ~~second volume~~ anode inlet, at least a portion of the fluid communication between the ~~first volume~~ extended edge seal input chamber and the ~~second volume~~ anode inlet comprising fluid flow through the plurality of inlet baffle apertures, a length of the inlet baffle comprising at least 60% of a length of the inlet boundary, an average height of the inlet baffle comprising 100% or more of

an average height along the inlet boundary, a combined cross-sectional area of the plurality of inlet baffle apertures comprising 0.5% to 6.0% of a total cross-sectional area at the inlet boundary.~~; and a gas flow outlet in fluid communication with the second volume.~~

~~2.~~ The fuel cell stack ~~element~~ of claim 1, wherein at least one of the plurality of inlet baffle apertures has a characteristic dimension of 0.25 mm or more; or wherein each of the plurality of inlet baffle apertures has a characteristic dimension of 0.25 mm or more.

~~3.~~ The fuel cell stack ~~element~~ of claim 1, wherein the combined cross-sectional area of the plurality of inlet baffle apertures is 0.5% to 2.5% of the total cross-sectional area at the inlet boundary; or wherein a length of the inlet baffle is less than the length of the inlet boundary by 0.05% to 5.0% of the length of the inlet boundary; or a combination thereof.

~~4.~~ The fuel cell stack ~~element~~ of claim 1, wherein the length of the inlet baffle comprises the length of the inlet boundary.

~~5.~~ The fuel cell stack ~~element~~ of claim 1, further comprising:

~~a third volume~~ an anode outlet in fluid communication with ~~the gas flow outlet, the gas flow~~ an anode outlet ~~being~~ manifold the anode outlet in ~~indirect~~ fluid communication with ~~the second volume via the third volume~~ an anode flow field;

an outlet baffle comprising a plurality of outlet baffle apertures at an outlet boundary between the ~~first volume~~ anode active area and the ~~second volume~~ anode outlet manifold, at least a portion of the fluid communication between the ~~first volume~~ anode active area and the ~~second volume~~ anode outlet manifold comprising fluid flow through the plurality of outlet baffle apertures, a length of the outlet baffle comprising at least 60% of a length of the outlet boundary, an average height of the outlet baffle comprising 100% or more of an average height along the outlet boundary, a combined cross-sectional area of the plurality of outlet baffle apertures comprising 0.5% to 6.0% of a total cross-sectional area at the outlet boundary.

~~6.~~ The fuel cell stack ~~element~~ of claim 5, wherein the combined cross-sectional area of the plurality of inlet baffle apertures is different from the combined cross-sectional area of the plurality of outlet baffle apertures; or wherein one or more inlet baffle apertures comprise a different characteristic dimension than one or more outlet baffle apertures; or wherein a length of the inlet baffle is different than a length of the outlet baffle; or a combination thereof.

~~7.~~ The fuel cell stack ~~element~~ of claim 1, wherein apertures in a portion of the inlet baffle that is farthest from the ~~gas flow~~ anode inlet comprise 25% or more of the combined cross-sectional area of the inlet baffle apertures, the portion of the inlet baffle comprising 5% to 20% of a length of the inlet boundary.

~~8. The fuel cell stack element of claim 1, wherein the second volume comprises at least a portion of an anode active area and an associated anode flow field, the first volume comprising at least a portion of an extended edge seal input chamber, the extended edge seal input chamber being adjacent to a first side of a fuel cell stack, the gas flow inlet being adjacent to a second side of the fuel cell stack.~~

~~9. The fuel cell stack element of claim 8, wherein the gas flow inlet further comprises an inlet flow blocker, the inlet flow blocker being positioned at an oblique angle relative to the inlet baffle; or wherein the second volume further comprises an outlet flow blocker, the outlet flow blocker being positioned at an oblique angle relative to the inlet baffle; or a combination thereof.~~

~~10. The fuel cell stack element of claim 1, wherein the second volume comprises at least a portion of a cathode active area and an associated cathode flow field, the first volume comprising at least a portion of an extended edge seal input chamber, the extended edge seal input chamber being adjacent to a first side of a fuel cell stack, the gas flow inlet being adjacent to a second side of the fuel cell stack.~~

~~11. The fuel cell stack element of claim 10, wherein the gas flow inlet further comprises an inlet flow blocker, the blocker being positioned at an oblique angle relative to the inlet baffle.~~

8. The fuel cell stack of claim 1, wherein the extended edge seal input chamber is configured to receive anode inlet gas provided to the fuel cell stack from the anode input manifold in a first direction relative to the fuel cell stack and output the anode inlet gas into the anode inlet in a second direction substantially perpendicular to the first direction.

9. The fuel cell stack of claim 1, further comprising: a second extended edge seal chamber extending away from the active anode area on a side opposite the anode inlet, wherein the second extended edge seal chamber is configured to receive an anode process gas and divert the anode process gas to an anode outlet manifold.

~~12.~~10. The fuel cell stack ~~element~~ of claim 1, wherein the ~~second volume~~ anode active area comprises a reforming catalyst.

~~13. The fuel cell stack element of claim 12, wherein the gas flow inlet is adjacent to a first side of a fuel cell stack, the gas flow outlet being adjacent to the first side of the fuel cell stack.~~

~~14.~~11. The fuel cell stack ~~element~~ of claim ~~12~~ 1, wherein the inlet baffle comprises a V-shaped baffle having a first side and a second side, and wherein apertures in the first side have at least one of a different aperture size and a different aperture pattern relative to apertures in the second side.

~~15.~~12. A fuel cell stack comprising:

a cathode input manifold adjacent to a cathode input side of the fuel cell stack;

an anode input manifold adjacent to an anode input side of the fuel cell stack that is different from the cathode input side;

a cathode output manifold adjacent to a cathode output side of the fuel cell stack that is different from the cathode input side and the anode input side;

a fuel cell comprising:

~~an anode comprising an anode inlet, an anode active area, and an associated anode flow field; a cathode comprising a cathode inlet, a cathode active area, and an associated cathode flow field, the cathode inlet being substantially parallel to the anode inlet;~~

an anode comprising an anode inlet located on the anode inlet side of the fuel cell stack, an extended edge seal input chamber, and an anode active area, the anode inlet being in fluid communication with the anode input manifold, the extended edge seal input chamber being located on the cathode input side or the cathode output side, and the extended edge seal input chamber being in fluid communication with the anode input and the anode active area through an anode active area inlet, wherein the anode active area inlet is located on the cathode input side or the cathode output side;

a cathode comprising a cathode inlet and a cathode active area, the cathode inlet being substantially parallel to the anode inlet;

an electrolyte matrix layer separating the anode and the cathode; and

~~an extended edge seal input chamber adjacent to a first side of the fuel cell stack, the first side being the cathode input side or the anode input side, the extended edge seal input chamber being in fluid communication with the anode input manifold when the first side is the cathode input side, the extended edge seal input chamber being in fluid communication with the cathode input manifold when the first side is the anode input side; and~~

an inlet baffle located adjacent to the anode active area inlet, the inlet baffle comprising a plurality of inlet baffle apertures at an inlet boundary ~~of a first input chamber volume of the extended edge seal input chamber and optionally being substantially parallel to the anode inlet~~ between the extended edge seal input chamber and the anode inlet, at least a portion of the fluid communication between the extended edge seal input chamber and the anode inlet comprising fluid flow through the plurality of inlet baffle apertures, a length of the inlet baffle comprising at least 60% of a length of the inlet boundary, an average height of the inlet baffle comprising 100% or more of an average height along the inlet boundary, a combined cross-sectional area of the plurality of inlet baffle apertures ~~being~~ comprising 0.5% to 6.0% of a total cross-

sectional area at the inlet boundary., ~~the first input chamber volume being in fluid communication with, via at least the plurality of inlet baffle apertures,~~

~~a) at least one of the anode flow field and the cathode flow field, or~~

~~b) a second input chamber volume of the extended edge seal input chamber, the second input chamber volume being in fluid communication with either the anode flow field via the anode inlet or the cathode flow field via the cathode inlet.~~

~~16.~~13. The fuel cell stack of claim ~~15~~ 12, wherein the combined cross-sectional area of the plurality of inlet baffle apertures is 0.5% to 2.5% of the total cross-sectional area at the inlet boundary; or wherein a length of the inlet baffle is less than a length of the inlet boundary by 0.05% to 5.0% of the length of the inlet boundary; or a combination thereof.

~~17.~~14. The fuel cell stack of claim ~~15~~ 12, wherein apertures in a portion of the inlet baffle that is farthest from the ~~gas flow~~ anode inlet comprise 25% or more of the combined cross-sectional area of the inlet baffle apertures, the portion of the inlet baffle comprising 5% to 20% of a length of the inlet boundary.

~~18.~~15. The fuel cell stack of claim ~~15~~ 12, wherein at least one of the plurality of inlet baffle apertures has a characteristic dimension of 0.25 mm or more; or wherein each of the plurality of inlet baffle apertures has a characteristic dimension of 0.25 mm or more.

~~19.~~16. The fuel cell stack of claim ~~15~~ 12, further comprising

an ~~extended edge seal output chamber~~ outlet baffle located adjacent to ~~a third side of the fuel cell stack; a gas flow outlet in fluid communication with the extended edge seal output chamber; and~~ an ~~outlet baffle~~ anode active area outlet comprising a plurality of outlet baffle apertures ~~at an outlet boundary of a first output chamber volume of the extended edge seal input chamber and optionally being substantially parallel to the anode outlet~~, a cross-sectional area of the plurality of outlet baffle

apertures being 0.5% to 6.0% of a total cross-sectional flow field area at ~~the~~ an outlet boundary.~~, the first output chamber volume being in fluid communication with, via at least the plurality of outlet baffle apertures,~~

~~c) at least one of the anode flow field and the cathode flow field, or~~

~~d) a second output chamber volume of the extended edge seal output chamber, the second output chamber volume being in fluid communication with the at least one of the anode flow field and the cathode flow field.~~

~~20.~~17. The fuel cell stack of claim ~~19~~ 16, wherein the cross-sectional area of the plurality of outlet baffle apertures is 0.5% to 2.5% of the total cross-sectional area at the outlet boundary; or wherein a length of the outlet baffle is less than a length of the outlet boundary by 0.05% to 5.0% of the length of the outlet boundary; or a combination thereof.

~~21. The fuel cell stack of claim 15, wherein the anode inlet manifold further comprises an inlet flow blocker in a flow path between the anode inlet manifold and the extended edge seal input chamber, the blocker being positioned at an oblique angle relative to the inlet baffle; or wherein the fuel cell stack further comprises an outlet flow blocker, the blocker being at least partially positioned in the second output chamber volume and being position at an oblique angle relative to the outlet baffle; or a combination thereof.~~

~~22. A method for operating a fuel cell, the fuel cell comprising an anode, a cathode, and an electrolyte matrix layer separating the anode and the cathode, the method comprising: introducing an anode input flow into a gas flow inlet of an extended edge seal input chamber adjacent to a first side of the fuel cell; passing at least a portion of the anode input flow through a plurality of inlet baffle apertures in an inlet baffle, the inlet baffle defining an inlet boundary of a first input chamber volume of the extended edge seal input chamber and optionally being substantially parallel to an anode inlet of the anode, a cross sectional area of the plurality of inlet baffle apertures being 0.5% to 6.0% of a total cross sectional area at the inlet boundary, the first input~~

~~chamber volume being in fluid communication with, via at least the plurality of inlet baffle apertures,~~

~~a) an anode flow field associated with an anode active area of the anode, or~~

~~b) a second input chamber volume of the extended edge seal input chamber, the second input chamber volume being in fluid communication with the anode flow field; introducing a cathode input flow into a cathode input of the cathode; and operating the molten carbonate fuel cell to form an anode output flow, a cathode output flow, and electricity.~~

~~23. The method of claim 22, further comprising: passing at least a portion of the anode output flow through a plurality of outlet baffle apertures in an outlet baffle, the outlet baffle defining an outlet boundary of a first output chamber volume of an extended edge seal output chamber and being substantially parallel to an anode outlet of the anode, a cross-sectional area of the plurality of outlet baffle apertures being 0.5% to 6.0% of a total cross-sectional flow field area at the outlet boundary, the first output chamber volume being in fluid communication with, via at least the plurality of outlet baffle apertures,~~

~~c) the anode flow field, or~~

~~d) a second output chamber volume of the extended edge seal output chamber, the second output chamber volume being in fluid communication with the anode flow field; and passing the anode output flow out of a gas flow outlet of the extended edge seal output chamber.~~

~~24. The method of claim 22, wherein a pressure drop across the inlet baffle is 0.1 kPa to 1.0 kPa.~~

~~25. The method of claim 22, wherein at least one of the plurality of inlet baffle apertures has a characteristic dimension of 0.25 mm or more; or wherein each of the plurality of inlet baffle apertures has a characteristic dimension of 0.25 mm or more.~~