CLAIMS

~~WHAT IS CLAIMED IS:~~

1. A method comprising:

coupling a first portion of a plate coupling surface of a backing plate to a component coupling surface of a gas turbine engine component , ~~to create~~ the coupling creating a material addition area having boundaries between the gas turbine engine component and a second portion of the ~~backing~~ plate coupling surface that extends away from the gas turbine engine component;

conveying a metal powder to be located in the material addition area of the coupled gas turbine engine component and backing plate; and

forming a plurality of repair layers throughout the material addition area by fusing the metal powder with an electromagnetic energy, wherein each of the repair layers of the plurality of repair layers is offset a different amount from the backing plate.

2. The method of claim 1, which further includes removing a portion of a gas turbine engine component to be repaired to reveal a through-cut and finishing the gas turbine engine component by eliminating excess material.

3. The method of claim 2, wherein the eliminating includes removing a portion of the backing plate, wherein a final repaired gas turbine engine component includes a remaining portion of the backing plate, and wherein a thickness of the plurality of repair layers is smaller than a lateral reach of the plurality of repair layers throughout the material addition area.

4. The method of claim 2, wherein the eliminating includes removing the backing plate, and wherein the plurality of repair layers is parallel with the backing plate.

5. The method of claim 1, wherein the fusing includes fusing to the gas turbine engine component, and wherein the backing plate is a polycrystalline backing plate.

6. The method of claim 1, which further includes removing a portion of a gas turbine engine component to be repaired to reveal a through-cut,

wherein the electromagnetic energy is provided with a laser, and wherein the plurality of repair layers is transverse to the through-cut of the gas turbine engine component.

7. A method comprising:

adding material to a gas turbine engine component, the adding including:

coupling a substrate to the gas turbine engine component such that a coupled portion of the substrate extends alongside a coupled portion of the gas turbine engine component and to an edge of the gas turbine engine component, the substrate further having an un-coupled portion that extends beyond the coupled portion of the substrate and past the edge of the gas turbine engine component, the un-coupled portion of the substrate forming a base for a deposit of material to create an extended surface of the gas turbine engine component;

energizing a metal feedstock above the substrate to create a fused metal coupled with the gas turbine engine component;

as a result of the energizing, creating a first layer of metal parallel with the substrate, the first layer having a first thickness; and

as a result of the energizing, creating a second layer of metal parallel with the first layer, the first layer disposed between the second layer and the substrate, the second layer having a second thickness.

8. The method of claim 7, which further includes finishing the gas turbine engine component after the forming to remove material outside of a net shape, ~~and~~ wherein a length of the first layer is larger than the first thickness ~~and~~, wherein the length is a distance along a stack of first layer and second layer parallel with the substrate in a direction away from the gas turbine engine component toward an end of the substrate.

9. The method of claim 7, wherein the metal feedstock is a metal powder, and wherein as a result of the creating, forming a stack of layers having a stack thickness, the thickness smaller than a length of the stack as it extends to cover an area; and

wherein the energizing includes lasing the metal feedstock with a laser.

10. The method of claim 7, which further includes removing a damaged portion of the gas turbine engine component, and wherein the forming is a repair process of a damaged gas turbine engine component; and

which further includes removing the substrate.

11. The method of claim 10, wherein the removing includes removing a portion of the substrate and leaving another portion coupled to the gas turbine engine component.

12. A method comprising:

coupling a gas turbine engine component with a sacrificial substrate;

directing a feedstock material to a work area of the gas turbine engine component;

fusing the feedstock material to the gas turbine engine component via an electromagnetic energy to create a layer of metal;

forming a plurality of layers with the fusing; and

removing a portion of the sacrificial substrate, a remaining portion of the sacrificial substrate forming part of a refurbished gas turbine engine component.

13. The method of claim 12, which further includes removing a portion of the gas turbine engine component prior to the forming, and wherein the plurality of layers are parallel with the sacrificial substrate.

14. The method of claim ~~16~~13, wherein the electromagnetic energy is from a laser; and wherein the feedstock material is a powdered metal.

15. The method of claim 12, wherein a thickness of the plurality of layers is smaller than a width of the plurality of layers.