CLAIMS

What is claimed is:

1. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end closer to an axis of rotation of the rotor than the distal end when the turbine blade is incorporated into the rotor;

wherein at least 35% of the mass and/or volume of the turbine blade is within 25% of a distance from the proximal end to the distal end of the turbine blade.

2. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end closer to an axis of rotation of the rotor than the distal end when the turbine blade is incorporated into the rotor;

wherein at least 60% of the mass and/or volume of the turbine blade is within 50% of a distance from the proximal end to the distal end of the turbine blade.

3. A turbine component, comprising:

a rotor comprising a first turbine blade and a second turbine blade, the first turbine blade and the second the turbine blade each comprising:

a distal end;

a proximal end closer to an axis of rotation of the rotor than the distal end;

a longitudinal axis passing through the proximal end and the distal end; and

a center of gravity within 45% of a distance along the longitudinal axis from the axis of rotation of the rotor to the distal end of the turbine blade.

4. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end closer to an axis of rotation of the rotor than the distal end when the turbine blade is incorporated into the rotor;

wherein the turbine blade has a longitudinal dimension extending from the proximal end to the distal end; and

wherein the turbine blade is configured such that, when incorporated into the rotor, fluid flow along the longitudinal dimension induces rotation of the rotor.

5. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end closer to an axis of rotation of the rotor than the distal end when the turbine blade is incorporated into the rotor;

wherein the turbine blade has a thickness dimension, a longitudinal dimension extending from the proximal end to the distal end, and a lateral dimension perpendicular to the thickness dimension and the longitudinal dimension;

wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the longitudinal dimension, that is in the shape of a first foil; and

wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the lateral dimension, that is in the shape of a second foil.

6. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end;

wherein the turbine blade has a thickness dimension, a longitudinal dimension extending from the proximal end to the distal end, and a lateral dimension perpendicular to the thickness dimension and the longitudinal dimension;

wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the longitudinal dimension, that is in the shape of a first foil; and

wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the lateral dimension, that is in the shape of a second foil.

7. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

(a) a leading edge and a rib along at least a portion of the leading edge;

(b) a leading edge, a trailing edge, and a vane extending from the leading edge to the trailing edge; and/or

(c) a ratio of the largest chord and the smallest chord on the proximal side of the largest chord in the lateral dimension that is greater than or equal to 1.1.

8. The turbine component of any one of claims 3-7, wherein at least 35% of the mass and/or volume of the turbine blade is within 25% of a distance from the proximal end to the distal end of the turbine blade.

9. The turbine component of any one of claims 1-8, wherein at least 35% of the mass of the turbine blade is within 25% of a distance from the proximal end to the distal end of the turbine blade.

10. The turbine component of any one of claims 1-9, wherein at least 35% of the volume of the turbine blade is within 25% of a distance from the proximal end to the distal end of the turbine blade.

11. The turbine component of any one of claims 1-2, 4-10, wherein the center of gravity of the turbine blade is within 45% of a distance along the longitudinal axis from the axis of rotation of the rotor to the distal end of the turbine blade.

12. The turbine component of any one of claims 1-3, 5-11, wherein the turbine blade is configured such that, when incorporated into the rotor, fluid flow along the longitudinal dimension induces rotation of the rotor.

13. The turbine component of any one of claims 1-5, 7-12, wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the longitudinal dimension, that is in the shape of a first foil.

14. The turbine component of any one of claims 1-5, 7-13, wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the lateral dimension, that is in the shape of a second foil.

15. The turbine component of claim 4, 12-14, wherein the fluid is water.

16. The turbine component of any one of claims 1-15, wherein the turbine blade is configured such that, when incorporated into the rotor, fluid flow along the lateral dimension induces rotation of the rotor.

17. The turbine component of any one of claims 5-6, 13-16, wherein the first foil and is a hydrofoil and second foil is a hydrofoil.

18. The turbine component of any one of claims 5-6, 13-16, wherein the first foil is an airfoil and second foil is an airfoil.

19. The turbine component of any one of claims 1-18, wherein at least 90% of cross-sections, taken along a plane parallel to the thickness dimension and the longitudinal dimension at 1% increments across the lateral dimension are in the shape of a foil.

20. The turbine component of any one of claims 1-19, wherein at least 90% of cross-sections, taken along a plane parallel to the thickness dimension and the lateral dimension at 1% increments across the longitudinal dimension are in the shape of a foil.

21. The turbine component of any one of claims 1-2, 4-20, wherein the turbine blade is a first turbine blade, and the turbine component comprises a second turbine blade configured to be incorporated into the rotor.

22. The turbine component of any one of claims 1-2, 4-21, wherein the turbine blade is incorporated into the rotor.

23. The turbine component of any one of claims 1-2, 4-22, wherein the rotor has or is configured to have a single turbine blade.

24. The turbine component of any one of claims 1-23, wherein the rotor comprises a hub.

25. The turbine component of claim 24, wherein the turbine blade is attached to and extends from the hub.

26. The turbine component of any one of claims 24-25, wherein the hub is hollow.

27. The turbine component of any one of claims 24-26, wherein less than or equal to 90% of a volume bound by the exterior surface of the hub is occupied by solid material.

28. The turbine component of any one of claims 1-23, wherein the rotor comprises an exterior structure, and distal end of turbine blade is attached to exterior structure.

29. The turbine component of claim 28, wherein the exterior structure comprises a cylinder.

30. The turbine component of any one of claims 1-29, wherein the turbine blade comprises a leading edge and a rib along at least a portion of the leading edge.

31. The turbine component of any one of claims 1-30, wherein the turbine blade comprises a leading edge, a trailing edge, and a vane extending from the leading edge to the trailing edge.

32. The turbine component of any one of claims 7 and 31, wherein the vane has a first width at a first distance and a second width at a second, greater distance along an axis of the vane from the leading edge toward the trailing edge, wherein the first distance is greater than the second distance.

33. The turbine component of any one of claims 7 and 31-32, wherein a width of the vane decreases monotonically along an axis of the vane from the leading edge toward the trailing edge.

34. The turbine component of any one of claims 1-33, wherein at least a portion of the turbine blade is in the shape of a maple-seed.

35. The turbine component of any one of claims 1-34, wherein the turbine blade has a root portion having an ovoid cross-section.

36. The turbine component of any one of claims 1-35, wherein the turbine blade has a center of gravity near an interface of the root portion and wing portion.

37. The turbine component of any one of claims 1-36, wherein the turbine blade is configured to undergo autorotation in at least one fluid.

38. The turbine component of any one of claims 1-37, wherein at least one cross-section, taken along a plane parallel to the thickness dimension and the longitudinal dimension, is in the shape of a cambered foil.

39. The turbine component of any one of claims 1-38, wherein at least one cross-section, taken along a plane parallel to the thickness dimension and the lateral dimension, is in the shape of a cambered foil.

40. The turbine component of any one of claims 1-39, wherein at least 90%, of cross-sections, taken along a plane parallel to the thickness dimension and the lateral dimension at 1% increments across the longitudinal dimension, have one or more of a

chord length, maximum thickness, camber, or pitch angle that is at least 0.1% different than that of a directly adjacent cross-section.

41. The turbine component of any one of claims 1-40, wherein at least 90%, of cross-sections, taken along a plane parallel to the thickness dimension and the longitudinal dimension at 1% increments across the lateral dimension, have one or more of a chord length, maximum thickness, camber, or pitch angle that is at least 0.1% different than that of a directly adjacent cross-section.

42. The turbine component of any one of claims 1-41, wherein at least 50% of cross-sections of the turbine blade within 10% of a distance from the proximal end to the distal end of the turbine blade, taken along a plane parallel to the thickness and the lateral dimension of the turbine blade, have a positive camber.

43. The turbine component of any one of claims 1-41, wherein the ratio of the largest chord and the smallest chord on the proximal side of the largest chord in the lateral dimension, is greater than or equal to 1.1.

44. The turbine component of any one of claims 1-43, wherein at least a portion of the turbine blade is twisted along a longitudinal dimension.

45. The turbine component of any one of claims 1-44, wherein the turbine component is a part of a hydroturbine.

46. The turbine component of any one of claims 1-44, wherein the turbine component is a part of a wind turbine.

47. The turbine component of claim 45, wherein the hydroturbine comprises an anchor point.

48. The turbine component of claim 47, wherein the anchor point is buoyant.

49. The turbine component of claim 47, wherein the anchor point is anchored to the ground.

50. A method, comprising exposing the turbine component of any one of claims 1-49 to a fluid.

51. The method of claim 50, wherein the fluid is water.

Claims

What is claimed is:

1. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end closer to an axis of rotation of the rotor than the distal end when the turbine blade is incorporated into the rotor;

wherein the turbine blade has a longitudinal dimension extending from the proximal end to the distal end;

wherein the turbine blade is configured such that, when incorporated into the rotor, fluid flow along the longitudinal dimension induces rotation of the rotor; and

wherein at least 35% of the mass and/or volume of the turbine blade is within 25% of a distance from the proximal end to the distal end of the turbine blade.

2. The turbine component of claim 1, wherein the turbine blade has a thickness dimension, and wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the longitudinal dimension, that is in the shape of a foil.

3. The turbine component of claim 1, wherein the turbine blade has a thickness dimension and a lateral dimension perpendicular to the thickness dimension and the longitudinal dimension, and wherein the turbine blade has at least one cross-section, taken along a plane parallel to the thickness dimension and the lateral dimension, that is in the shape of a foil.

4. The turbine component of claim 1, wherein the turbine blade is incorporated into the rotor, wherein the rotor comprises a hub, and wherein the hub is hollow.

5. The turbine component of claim 1, wherein the turbine blade is incorporated into the rotor, wherein the rotor comprises a hub having an exterior surface, and wherein less than or

equal to 90% of a volume bound by the exterior surface of the hub is occupied by solid material.

6. The turbine component of claim 1, wherein the turbine blade is configured to undergo autorotation in at least one fluid.

7. The turbine component of claim 1, wherein the turbine blade has a thickness dimension and a lateral dimension perpendicular to the thickness dimension and the longitudinal dimension, and wherein at least 50% of cross-sections of the turbine blade within 10% of a distance from the proximal end to the distal end of the turbine blade, taken along a plane parallel to the thickness dimension and the lateral dimension of the turbine blade, have a positive camber.

8. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end closer to an axis of rotation of the rotor than the distal end when the turbine blade is incorporated into the rotor;

wherein the turbine blade has a thickness dimension, a longitudinal dimension extending from the proximal end to the distal end, and a lateral dimension perpendicular to the thickness dimension and the longitudinal dimension;

wherein the turbine blade is configured such that, when incorporated into the rotor, fluid flow along the longitudinal dimension induces rotation of the rotor; and

wherein at least 90% of cross-sections, taken along a plane parallel to the thickness dimension and the lateral dimension at 1% increments across the longitudinal dimension, have one or more of a chord length, maximum thickness, camber, or pitch angle that is at least 0.1% different than that of a directly adjacent cross-section.

9. The turbine component of claim 8, wherein at least 90% of cross-sections, taken along a plane parallel to the thickness dimension and the longitudinal dimension at 1% increments across the lateral dimension, have one or more of a chord length, maximum thickness, camber, or pitch angle that is at least 0.1% different than that of a directly adjacent cross-section.

10. The turbine component of claim 8, wherein the turbine blade is configured such that, when incorporated into the rotor, fluid flow along the lateral dimension induces rotation of the rotor.

11. The turbine component of claim 8, wherein the turbine blade is incorporated into the rotor, wherein the rotor comprises a hub, and wherein the turbine blade is attached to and extends from the hub.

12. The turbine component of claim 8, wherein the turbine blade comprises a leading edge and a rib along at least a portion of the leading edge.

13. The turbine component of claim 12, wherein the turbine blade further comprises a trailing edge and a vane extending from the leading edge to the trailing edge, wherein the vane has a first width at a first distance and a second width at a second, greater distance along an axis of the vane from the leading edge toward the trailing edge, wherein the first width is greater than the second width.

14. The turbine component of claim 12, wherein the turbine blade further comprises a trailing edge and a vane extending from the leading edge to the trailing edge, wherein a width of the vane decreases monotonically along an axis of the vane from the leading edge toward the trailing edge.

15. The turbine component of claim 8, wherein the turbine blade comprises a leading edge, a trailing edge, and a vane extending from the leading edge to the trailing edge.

16. The turbine component of claim 8, wherein the turbine blade comprises a ratio of a largest chord and a smallest chord on a proximal side of the largest chord in the lateral dimension that is greater than or equal to 1.1.

17. The turbine component of claim 8, wherein the turbine blade is in the shape of a maple seed.

18. The turbine component of claim 8, wherein the turbine blade has a root portion having an ovoid cross-section.

19. The turbine component of claim 8, wherein the fluid flow is water flow.

20. A method, comprising exposing the turbine component of claim 8 to water.

21. A turbine component, comprising:

a turbine blade configured to be incorporated into a rotor of a turbine, the turbine blade comprising:

a distal end; and

a proximal end closer to an axis of rotation of the rotor than the distal end when the turbine blade is incorporated into the rotor;

wherein the turbine blade has a thickness dimension, a longitudinal dimension extending from the proximal end to the distal end, and a lateral dimension perpendicular to the thickness dimension and the longitudinal dimension;

wherein the turbine blade is configured such that, when incorporated into the rotor, fluid flow along the longitudinal dimension induces rotation of the rotor; and

wherein at least 90% of cross-sections, taken along a plane parallel to the thickness dimension and the longitudinal dimension at 1% increments across the lateral dimension, have one or more of a chord length, maximum thickness, camber, or pitch angle that is at least 0.1% different than that of a directly adjacent cross-section.