WHAT IS CLAIMED IS:

1. A method of processing biomass, the method comprising:

reducing one or more dimensions of individual pieces of biomass;

exposing the biomass to a first dose of electron beam radiation using a scanning electron beam;

conveying the biomass, using a screw; and

exposing the biomass to a second dose of electron beam radiation using a scanning electron beam;

wherein the electron beam radiation from the first dose and the second dose are each provided by a scanning electron beam device operated at a power from about 50 kW to about 500 kW, and the first dose and the second dose of electron beam radiation are each provided at a dose rate of about 1 Mrad per second to about 10 Mrad per second; and

wherein the biomass comprises a mixture of cellulosic and lignocellulosic material.

2. The method of claim 1 further comprising, after exposure to the second dose of electron beam radiation, subjecting the biomass to a primary process to form a product.

3. The method of claim 2 wherein the primary process comprises fermentation.

4. The method of claim 1 wherein exposure to the first dose and the second dose of electron beam radiation is performed on the biomass while the biomass is exposed to air or air enriched with an oxidizing gas.

5. The method of claim 1 wherein the first dose and the second dose of electron beam radiation are each applied at a combined total dosage of between about 10 Mrad and about 150 Mrad.

6. The method of claim 2 wherein the primary process comprises contacting the biomass with a microorganism and/or an enzyme having the ability to convert at least a portion of the biomass to the product.

7. The method of claim 6 wherein the product comprises a combustible fuel.

8. The method of claim 6 wherein the microorganism comprises a bacterium or a yeast.

9. The method of claim 6 wherein to convert comprises fermentation of sugars derived from the biomass.

10. The method of claim 1 wherein the first dose and the second dose of electron beam radiation are each provided at a power of about 50 kW.

11. The method of claim 1 wherein the first dose and the second dose of electron beam radiation are each applied at a combined total dosage of at least about 10 Mrad.

12. The method of claim 1 wherein the first dose and the second dose of electron beam radiation are each applied at a power of about 100 kW.

13. The method of claim 1 wherein the first dose and the second dose of electron beam radiation are each applied at a power of about 250 kW.

14. The method of claim 1 wherein the first dose and the second dose of electron beam radiation are each applied at a power of about 500 kW.