temperature range of the device for conversion of the thermal energy of the waste heat from other power plants is an example of an application for the two stage thermal cycle.

By making the dimension of the circuit size of the order of 10^{-3} cm in each dimension while maintaining a constant power output potential from each cell, megawatts of power output potential per kilogram of module weight is obtained. This is an important improvement in the capability of the device for the application of building satellite solar power stations for supplying energy for earth use.

What is claimed is:

1. A device for directly converting thermal energy to electric energy comprising:

a. a first layer comprising a plurality of first microcircuit modules with each microcircuit module having a first circuit element for converting thermal energy into electric voltage fluctuations;

b. a second layer contiguous to said first layer comprising a plurality of second microcircuit modules equal in number to said first microcircuit modules, one each of said second microcircuit modules electrically coupled to one each of said first microcircuit modules and one each of said second microcircuit modules having a circuit element for electrically coupling the voltage fluctuations across a thermal barrier; and,

c. a third layer comprising an equal plural number of third microcircuit modules as said first and second layers, said third layer being contiguous to said second layer, one each of said third microcircuit modules being electrically coupled to one each of said second microcircuit modules, said third layer being also separated from said first layer by said thermal barrier, each of said third microcircuit modules having at least one non-linear circuit for converting the electric voltage fluctuations to D.C. electric power.

2. The device as recited in claim **1** including in each of said third layer circuit modules first means coupled to each other of said third layer circuit modules for adding the power output of each module in said third layer to the total power output of the plural number of said third microcircuit modules.

3. The device as recited in claim **1** wherein the non-linear circuit elements of the third layer circuit modules are classical effect, e.g., Schottky barrier diodes.

4. The device as recited in claim **1** wherein the non-linear circuit elements of the third layer circuit modules are quantum effect, e.g., tunnel diodes.

5. The device as recited in claim **1** wherein the circuit elements for converting thermal energy to electric voltage fluctuations in the first layer circuit modules are diodes.

6. The device as recited in claim **5** wherein diodes of smaller non-linearity are in the first layer circuit modules and diodes of larger non-linearity are in the third layer circuit modules.

7. The device as recited in claim **6** wherein quantum effect and classical effect diodes are in either the first or third layer circuit modules.

8. The device as recited in claim **1** wherein the circuit element for converting thermal energy to electric voltage fluctuations in the first layer circuit modules is a resistor.

9. The device as recited in claim **1** wherein the circuit element for converting thermal energy to electric voltage fluctuations in the first layer circuit modules are closely spaced contacts to a resistive film.

10. The device as recited in claim **1** wherein the thermal barrier in the second layer is a vacuum chamber between the first and third layers and wherein the second circuit elements in the second layer separately transfer the electric voltage fluctuations of one each first layer circuit module to one each third layer circuit module.

11. The device as recited in claim **10** wherein each of said second circuit elements in said second layer for transferring electric voltage fluctuations of one each first layer circuit modules to one each third layer circuit modules comprises a pair of capacitor plates attached to opposite walls of said vacuum chamber.

12. The device as recited in claim **1** in which said first, second and third microcircuit module dimensions of each of said first, second and third layers are of the order or from 10^{-2} cm to 10^{-6} cm in each dimension in the plane of the layers of the microcircuit modules.

13. The device as recited in claim **1** wherein the thickness of the layers of said first, second and third microcircuit modules is of the order of 10^{-1} cm to 10^{-5} cm and in which the layers are flexible.

14. The device as recited in claim **1** including in said first layer of microcircuit modules a radiation collection layer to concentrate and trap the incoming radiation energy from a radiation source.

15. The device as recited in claim **14** wherein the radiation collection layer is a thin flexible layer comprising an array of reflecting paraboloids with the axis of each paraboloid parallel to the direction of the incoming radiation, each paraboloid having a hole on its surface in the plane normal to the paraboloid axis and at the focus of the paraboloid whereby the concentrated radiation is directed on the front surface layer of the first layer circuit modules of the device.

16. The device as recited in claim **1** including in said third circuit element in said third layer microcircuit module an inductor for providing a direct current return path for the rectified current output of the circuit module.

17. The device as recited in claim **16** wherein the circuit element in said third layer of microcircuit modules providing a direct current return path for the full wave rectified current output of the circuit module is a second diode connected with opposite polarity in parallel with the first diode.

18. The device as recited in claim **2** wherein the circuit element in the third layer circuit module for adding the power output of each module to the total output of the plurality of the other third layer modules is a series-parallel circuit of conducting leads.

19. The device as recited in claim **1** wherein electrical energy is applied by an external source to said third layer and heat energy is applied to said third layer from an external source and said heat energy is abstracted by said first layer from said external heat source, whereby said device operates in a reversible mode as a heat pump.

20. The device as recited in claim **1** wherein heat energy is applied to said first layer from an external source and electrical energy is abstracted from said third layer, whereby said device operates as a direct heat-to-electrical converter.

21. The device as recited in claim **19** wherein said external heat source is third layer of a second device as recited in claim **20**.