[0039] Next, while the beam spot wanders over the PV system **1**, the operations in the previous paragraph are automatically being repeated by the controller **8** upon the power grid so as to strive to maintain the predetermined system output voltage or power level, by making changes or updates such that only well-illuminated sub-arrays remain connected to the power grid.

[0040] In the description above, for the purposes of explanation, numerous specific details have been set forth in order to provide a thorough understanding of the embodiments. It will be apparent however, to one skilled in the art, that one or more other embodiments may be practiced without some of these specific details. The particular embodiments described are not provided to limit the invention but to illustrate it. The scope of the invention is not to be determined by the specific examples provided above but only by the claims below. For example, although in FIG. **2** and in FIG. **3** the harvested energy output nodes are selected to be located at the top and bottom boundaries of the PV system's power grid, they could alternatively be located at the left and right boundaries. In other instances, well-known structures, devices, and operations have been shown in block diagram form or without detail in order to avoid obscuring the understanding of the description. Where considered appropriate, reference numerals or terminal portions of reference numerals have been repeated in the figure to indicate corresponding or analogous elements, which may optionally have similar characteristics.

[0041] It should also be appreciated that reference throughout this specification to "one embodiment", "an embodiment", "one or more embodiments", or "different embodiments", for example, means that a particular feature may be included in the practice of the invention. Similarly, it should be appreciated that in the description, various features are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects may lie in less than all features of a single disclosed embodiment. Thus, the claims following the Detailed Description are hereby expressly incorporated into this Detailed Description, with each claim standing on its own as a separate embodiment of the invention.

We claim:

1. A dynamically reconfigurable energy harvesting photovoltaic (PV) system comprising:

a plurality of PV energy harvesting sub-arrays wherein each sub-array comprises a group of photovoltaic cells that are electrically connected to each other to generate a voltage at a respective one of a plurality of pairs of sub-array power nodes;

a plurality of power management circuits each having a power input that is coupled to a respective one of the pairs of sub-array power nodes and a communications interface; and

a programmable power grid to which a power output of each of the power management circuits is coupled, the power grid having a plurality of bus rows, a plurality of bus columns, a plurality of bus management circuits each being positioned at a respective junction of a bus column and a bus row, and a harvested energy output node,

wherein each power management circuit is programmable through its communication interface during in-the-field use of the PV system to one of connect and disconnect its respective sub-array to the grid, and each bus management circuit is programmable through its communication interface to one of connect and disconnect a power path in the grid, so that selected sub-arrays are connected by selected power paths to be in parallel so as to produce a low voltage at the harvested energy output node, and, alternately, selected sub-arrays of the system are connected by selected power paths to be in series so as to produce a high voltage that is greater than the low voltage by at least a factor of ten.

2. The system of claim **1** wherein each bus row has a respective plurality of bus group segments that are coupled in a daisy chain manner by some of the bus management circuits, and

wherein each bus column has a respective plurality of bus group segments that are coupled in a daisy chain manner by some of the bus management circuits,

each bus group segment having a respective plurality of bus conductors.

3. The system of claim **2** wherein each bus management circuit is coupled to four adjacent bus group segments, and can be programmed to alternately connect and disconnect to each other a) a bus conductor from one of the four adjacent bus group segments and b) a bus conductor from another one of the four adjacent bus group segments.

4. The system of claim **1** wherein each of the power management circuits has a dc-dc converter coupled between the power input of the bus management circuit and the power grid.

5. The system of claim **1** wherein some of the cells in each sub-array are multi-junction cells, wherein each multi-junction cell has a plurality of junctions, wherein each of the junctions, or at least one subset of said junctions is independently coupled to a multi-junction power manager circuit associated with the multi-junction cell, the system further comprising

an electrical power system controller that is to program the power management circuits of low performing sub-arrays to one of a) disconnect the sub-arrays from the power grid in response to a signal from a multi-junction power manager circuit associated with a multi-junction cell in each of the sub-arrays that indicates low performance of a multi-junction cell in the sub-array, and b) where the multi-junction power manager circuit comprises a dc-dc boost voltage converter, connect the low-performing sub-arrays to the power grid through the boost voltage converter,

wherein the controller is to program the power management circuits of high performing sub-arrays to connect the sub-arrays to the power grid in response to a signal from a multi-junction power management circuit associated with a multi-junction cell in each of the sub-arrays that indicates high performance of a multi-junction cell in the sub-array.

6. The system of claim **1** further comprising:

a communications grid to which the communications interfaces of the power management circuits and bus management circuits are coupled; and