CLAIMS

1. A cleaning system for a solar panel, comprising:

a frame moveable in a transverse direction over the solar panel, the frame having transverse edges oriented in the transverse direction;

a brush assembly positioned within the frame, the brush assembly including a plurality of brush holders arranged within the frame, the brush holders moveable in a longitudinal direction within the brush assembly, each brush holder being adapted to interchangeably receive a brush for cleaning the solar panel; and

a liquid spray arrangement including:

a plurality of rows of nozzles positioned within the frame and oriented in the transverse direction, the plurality of rows of nozzles configured to spray at least one of water and a water detergent mix onto the solar panel; and

at least one additional row of nozzles adjacent to at least one of the transverse edges of the frame, the at least one additional row of nozzles positioned such that as each one of the plurality of brush holders is moved in a longitudinal direction and reaches the end of the frame to be positioned adjacent to the at least one of the transverse edges of the frame, the nozzles of the at least one additional row of nozzles are configured to spray the at least one of water and the water detergent mix onto each one of the plurality of brush holders positioned adjacent to the transverse edges of the frame to directly clean the brushes or the solar panel.

2. A cleaning system according to Claim 1, further comprising a forced air arrangement for applying forced air onto the solar panel.

3. A cleaning system according to Claim 2, in which the forced air arrangement includes a plurality of nozzles oriented to apply pressurized air onto the solar panel.

4. A cleaning system according to Claim 2, in which the forced air arrangement includes a plurality of fans situated within the frame at various longitudinal positions.

5. A cleaning system according to Claim 2, further comprising support bars for moveably supporting the frame as it moves over the solar panel.

6. A cleaning system according to Claim 5, further comprising a pulley system adapted to drive the frame relative to the support bars.

7. A cleaning system according to Claim 6, further comprising an independent power supply that provides power when the solar panels are inoperative.

8. A cleaning system according to Claim 7, in which the independent power supply includes a rechargeable battery that is chargeable by the solar panels while the solar panels are in operation, and dischargeable for providing electrical energy to the cleaning system when the solar panels are offline.

9. A cleaning system according to Claim 1, further comprising a pulley system for moving the brush holders in the longitudinal direction within the brush assembly relative to the frame.

10. A cleaning system according to Claim 5, further comprising:

a first sensor for determining a location of the frame relative to the support bars; and

a control unit coupled to the sensor and configured to reverse the transverse direction of travel of the frame when it receives data from the sensor indicating that the frame has reached a position limit of a pass over the solar panel.

11. A cleaning system according to Claim 10, further comprising:

a second sensor for determining an amount of water available to the cleaning system;

in which the control unit is coupled to the second sensor and is configured to reduce the use of the liquid spray arrangement upon receipt of data indicating low water availability.

12. A cleaning system according to Claim 10, in which the control unit is coupled to a diagnostic module that provides efficiency data for the solar panel, and is configured to activate or deactivate at least one of the liquid spray arrangement or the forced air arrangement depending upon received efficiency data.

13. A method of cleaning a solar panel, comprising:

providing a frame moveable in a transverse direction over the solar panel, the frame having transverse edges oriented in the transverse direction;

providing a brush assembly positioned within the frame, the brush assembly including a plurality of brush holders arranged within the frame, the brush holders moveable in a longitudinal direction within the brush assembly, each brush holder being adapted to receive interchangeable brushes for cleaning the solar panel, the brush assembly being incorporated in the frame;

providing a liquid spray arrangement including:

a plurality of rows of nozzles positioned within the frame and oriented in the transverse direction, the plurality of rows of nozzles configured to spray at least one of water and a water detergent mix onto the solar panel; and

at least one additional row of nozzles adjacent to at least one of the transverse edges of the frame, the at least one additional row of nozzles positioned such that as each one of the plurality of brush holders is moved in a longitudinal direction and reaches the end of the frame to be positioned adjacent to the at least one of the transverse edges of the frame, the nozzles of the at least one additional row of nozzles are configured to spray the at least one of water and the water detergent mix onto each one of the plurality of brush holders positioned adjacent to the transverse edges of the frame to directly clean the brushes or the solar panel;

moving the frame together with the brush assembly over a surface of the solar panel while contacting the brushes with the surface of the solar panel;

moving the brushes relative to the frame within the brush assembly; and

spraying a water detergent mixture onto the solar panel to dislodge debris and onto the brush assembly to clean the brushes.

14. A method according to Claim 13, further comprising applying forced air onto the solar panel to further dislodge debris from the solar panel.

15. A method according to Claim 13, in which the water detergent mixture is sprayed from at least one row of nozzles oriented along a direction of motion of the frame.

16. A method according to Claim 14, further comprising:

receiving information regarding an power generating efficiency of the solar panel; and

controlling the spraying of the water detergent mixture and application of forced air onto the solar panel based on the received information regarding the power generating efficiency of the solar panel.

17. A method according to Claim 16, further comprising:

controlling the motion of the frame based on the received information regarding the power generating efficiency of the solar panel.

18. A method according to Claim 13, further comprising:

detecting whether the frame has reached a positional limit in its motion over solar panel; and

reversing a direction of motion of the frame if the limit has been reached.

19. A method according to Claim 13, further comprising:

detecting a level of water available for cleaning the solar panel; and

controlling the spraying of the water detergent mixture onto the solar panel based on a detected level of water available.