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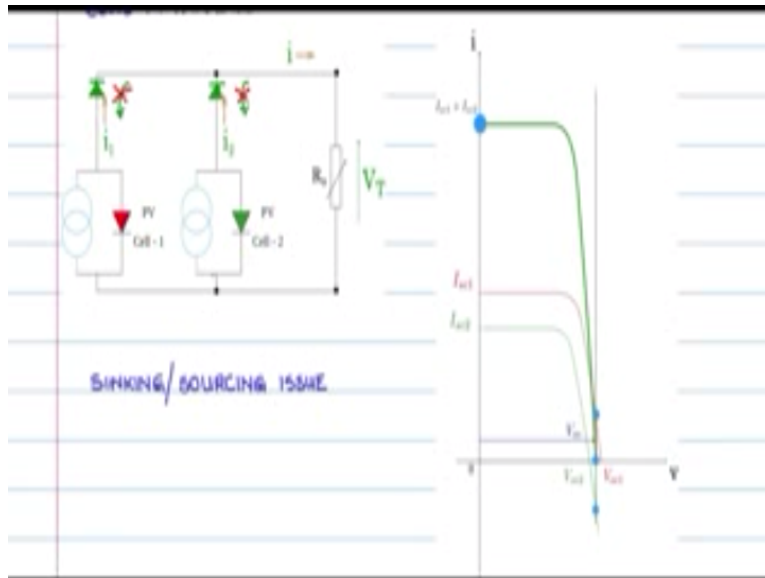
Design of Photovoltaic Systems

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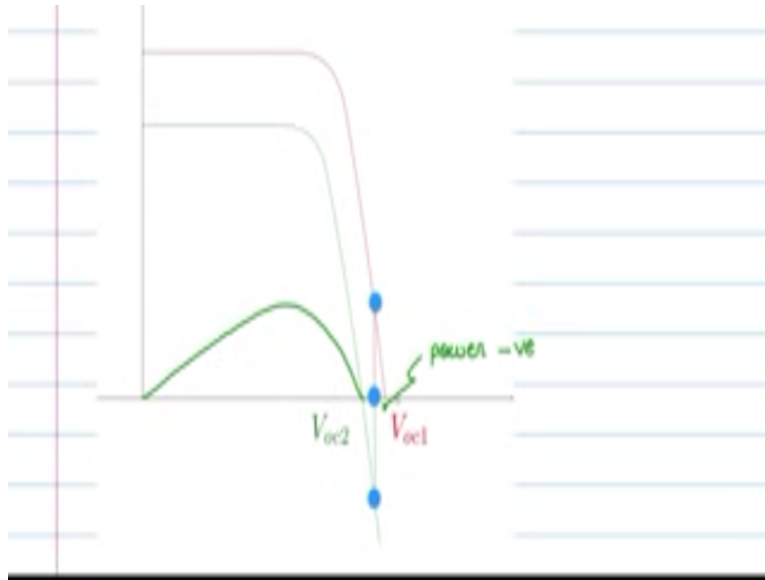
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Even the case of cells in parallel there is a problem of sinking sourcing issue as we discussed for the case of the series connection look at the I_v characteristic near the point where V_{oc} of the parallel system occurs we see that the cell to which is weak care of the too cell is operating as an sink and therefore dissipating power at becomes hot.

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And deficiency also would in order to protect the cells we need to introduce divots in an appropriate manner just like weight for the series connection of cells for that let us go back to the IV characteristic and look at this portion in a bit model detail let us zoom this and draw the power verse V curve here so let us draw up to the point up to this point as we see PV cell to this sourcing.

Further it goes in to the 4th quadrant like this and shows negative power which means sinking the portion I have shown here shaded is the portion here the power is negative and this is the region during which the PV cell to this dissipating acting like a resistor now how do we eliminate this so in order to eliminate this we should not allow negative current to flow.

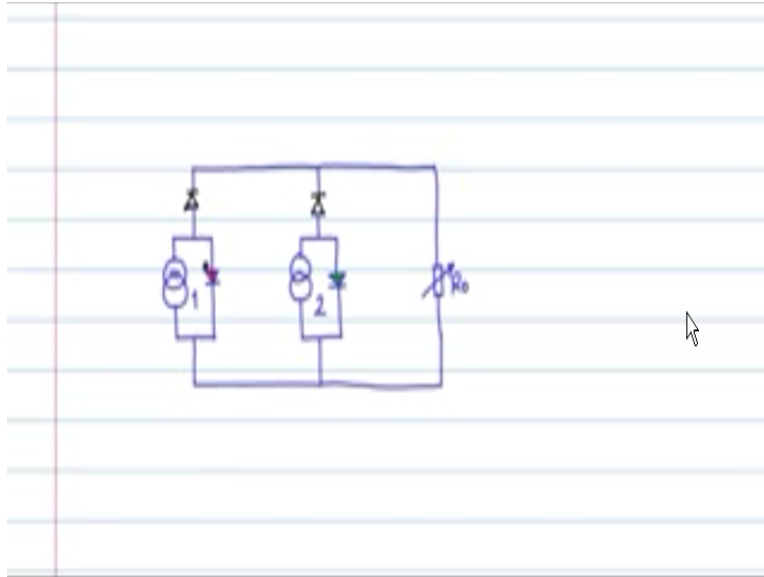
For that to happen we put a divot in series with each other cells like this so we put a divot there like that and shown and a divot here now the moment you have put this divot this protection divot here you will not have an negative current flowing in any of the parents so this will not happen because of the presence of the divot so this divot will act as the protection.

Once you have put this divot there will be a slight change in the characteristic the IV characteristic without the protection divot was like this for the overall parallel system the moment that protection divot is introduced there is no negative current and therefore when there is no negative current during this region the entire current to the load is given by cell 1.

So which means it will follow the cell 1 characteristics just write in the case of the series case after we put the protection divot so when protection divot is put will see that after the point after

this operating point when V_{oc} is reached we the PV cell to current becomes 0 it will continue to stay 0.

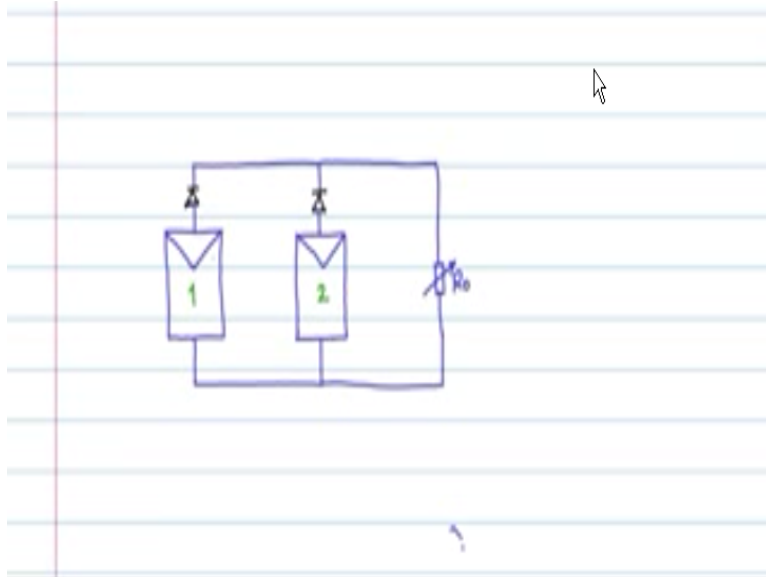
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And during that time the operating point will follow the IV characteristics of the PV cell 1 like this so this would be the entire IV cell characteristics of the parallel combination to the cell with the series protective diodes. So here you see two PV cells PV cell 1 PV cell 2 connected in parallel along with the load or not you have the protective diodes here which prevents current flow into the PV cell.

Now here to ask in the series case we cannot one diode for one Pn junction it would become too expensive and further they should be ideal diodes and therefore we put the protection diodes for group or a cluster of cells that is for a module so if we replace this single cell by a module then you will have a practical solution like this.

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So the module representing a group of PV cells of a higher voltage and current than a single PV junction so here you see that you have two modules module 1 and module 2 each of the module is having many PV cells and parallel this module 2 is also having many PV cells and parallel and the modules are protected with diodes so that you do not have reverse current flowing into the PV modules so this is how you connect the PV modules in parallel and also protect them.