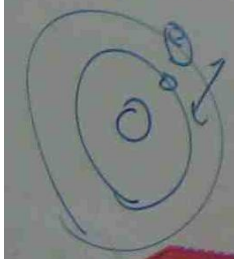
RECOMBINATION PROCESS

RELAXATION TO EQUILIBRIUM

LIGHT OF APPROPRIATE WAVE LENGTH SHINING ON A SEMI CONDUCTOR CREATES ELECTRON- HOLE PAIRS. THE CONCENTRATING OF CARRIERS IN ILLUMINATED MATERIAL WILL THEREFORE BE IN EXCESS OF THEIR VALUE IN DARK.
IF THE LIGHT IS SWITCHED OFF THESE CONCENTRATIONS DECAY BACK TO THE EQUILIBRIUM VALUES.

RADIATIVE RECOMBINATION

AN ELECTRON OCCUPYING A HIGHER ENERGY STATE MAKES A TRANSITION TO EMPTY LOWER ENERGY STATE WILL EMIT THE ENERGY



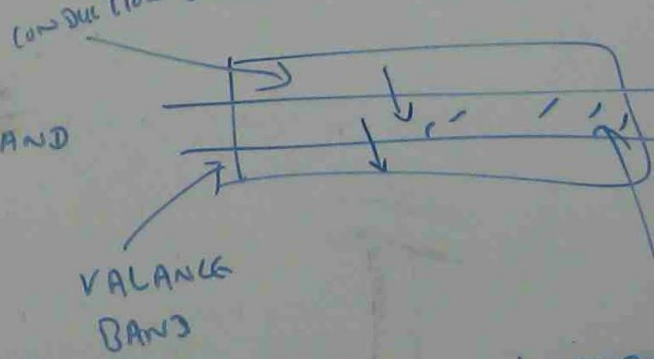
AUGER RECOMBINATION

THE ELECTRON RECOMBINING WITH THE HOLES GIVE THE EXCESS ENERGY TO A SECOND ELECTRON.

RECOMBINATION THROUGH TRAPS

IMPURITIES AND DEFECTS IN SEMICONDUCTORS CAN GIVE RISE TO ALLOWED ENERGY LEVEL.

- ELECTRON RELAX FROM CONDUCTION BAND ENERGIES TO DEFECT LEVEL
- THEN RELAX TO VALANCE BAND



RECOMBINATION AT SURFACE

SURFACES REPRESENT SEVERE DEFECTS IN THE CRYSTAL STRUCTURE. RECOMBINATION CAN THEREFORE OCCUR VERY EFFICIENTLY.

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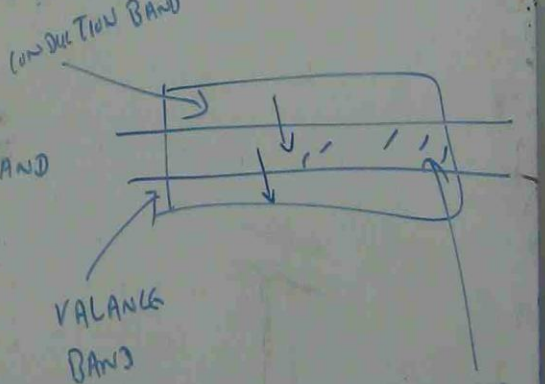

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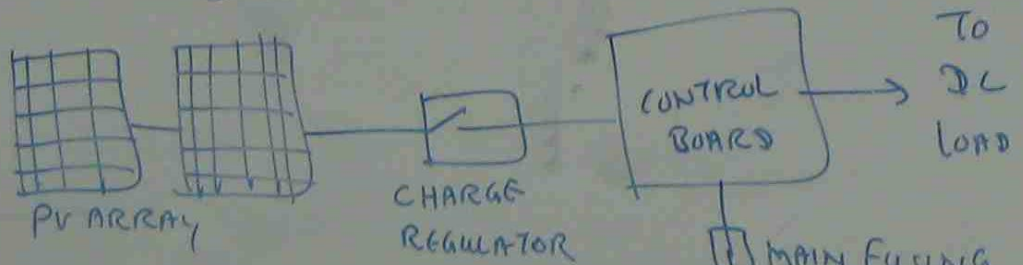
ELECTRONIC MATCHING

TO SOLVE THE PROBLEM OF MATCHING, A P.V ARRAY WITH A LOAD MAY BE CONTROLLED BY USE OF ELECTRONICS.

FOR PUMP CONTROLLERS AND MAXIMUM POWER POINT TRACKERS, THE ELECTRONIC CIRCUIT EFFECTIVELY REGULATES THE VOLTAGE AND CURRENT TO PROVIDE THE USEFUL POWER WHILE TRANSLATING THIS POWER TO DIFFERENT VOLTAGES AND CURRENTS NEEDED BY THE LOAD.

P.V SYSTEM CONFIGURATION CIRCUITS



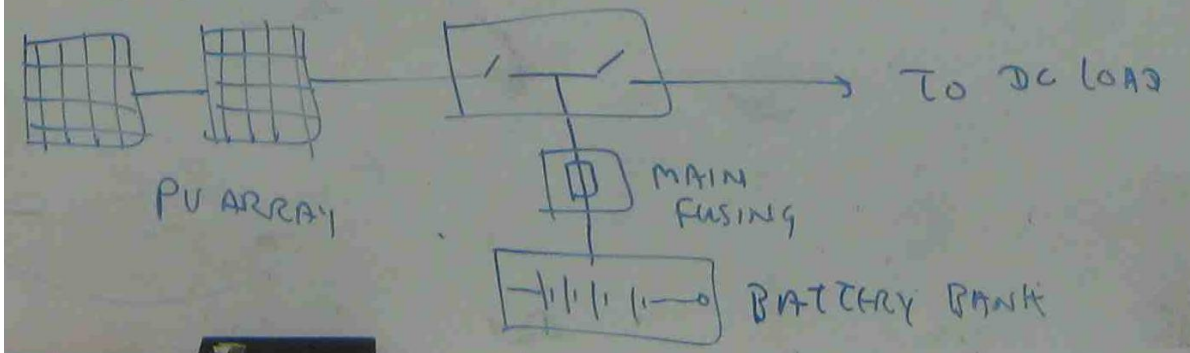
PV SYSTEM SUPPLYING DC LOAD WITHOUT BACKUP SUPPLY.

FEATURES of ABOVE SYSTEM

- IT NEEDS VERY LARGE ARRAY SIZE FOR POOR WEATHER
- DURING THE PROLONGED PERIOD OF OVER CAST WEATHER, ENERGY USE MUST BE REDUCED IF THE ARRAY SIZE IS BASED ON AVERAGE IRRADIATION BECAUSE THERE IS NO SUPPLEMENTARY ENERGY SOURCE SUCH AS GEN SET (GENERATOR SET)
- THE CONTROL BOARD CONTAINS DC CIRCUIT PROTECTION FOR DC LOAD AND P.V INPUT AS WELL AS ISOLATION SWITCH ETC.

THE CONTROL BOARD IS OFTEN CONUENIENT LOCATION FOR SYSTEM METERING.

PV ONLY SYSTEM USING INTEGRATED CHARGE REGULATOR/LOAD CONTROLLER

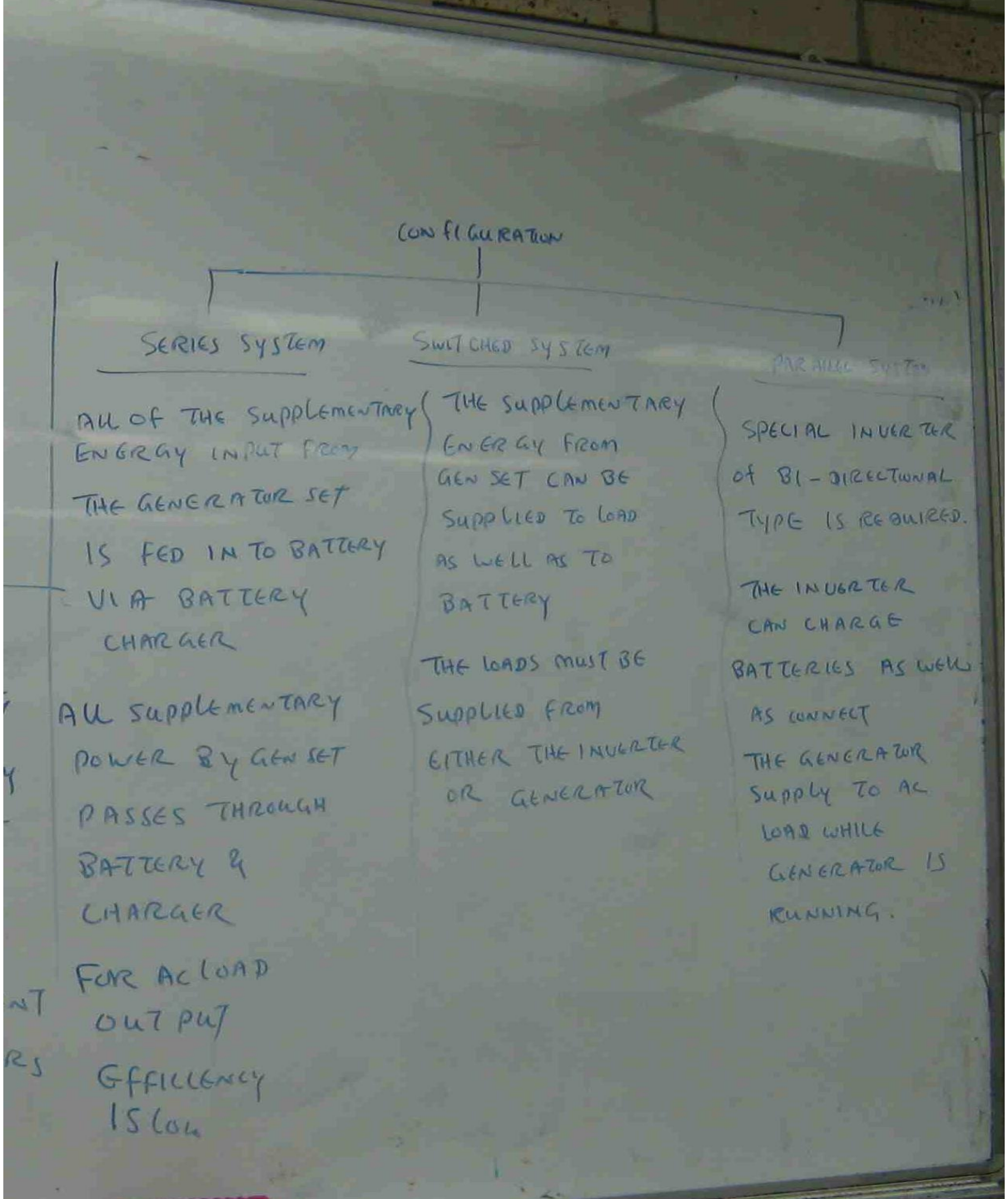


SOME CHARGE REGULATORS PROVIDE A CONNECTION POINT FOR DC LOADS. THIS NORMALLY USES TO PROVIDE A LOW BATTERY VOLTAGE LOAD DISCONNECT IN ORDER TO PROTECT THE BATTERY FROM EXCESSIVE DISCHARGE. THE LOAD CONTROLLER MAY ALSO BE PROGRAMMED TO SWITCH THE LOAD AT CERTAIN TIMES OF DAY (OR) DURING VERY LOW IRRADIANCE.

DC PV SYSTEM WITH BACK UP GEN SET

SYSTEM SUPPLYING AN AC LOAD INCORPORATING A GEN SET.

THREE CONFIGURATION
- THE WAY ENERGY FROM THE GEN SET IS USED
- USE OF DIFFERENT TYPES OF INVERTERS


CONFIGURATION
SERIES SYSTEM
SWITCHED SYSTEM
PARALLEL SYSTEM
ALL OF THE SUPPLEMENTARY ENERGY INPUT FROM THE GENERATOR SET IS FED IN TO BATTERY VIA BATTERY CHARGER
ALL SUPPLEMENTARY POWER BY GEN SET PASSES THROUGH BATTERY & CHARGER
FOR AC LOAD OUTPUT EFFICIENCY IS LOW
THE SUPPLEMENTARY ENERGY FROM GEN SET CAN BE SUPPLIED TO LOAD AS WELL AS TO BATTERY
THE LOADS MUST BE SUPPLIED FROM EITHER THE INVERTER OR GENERATOR
SPECIAL INVERTER of BI-DIRECTIONAL TYPE IS REQUIRED.
THE INVERTER CAN CHARGE BATTERIES AS WELL AS CONNECT THE GENERATOR SUPPLY TO AC LOAD WHILE GENERATOR IS RUNNING.