

Prevention of Islanding of wind farms by applying Dynamic Voltage Restorer (DVR)

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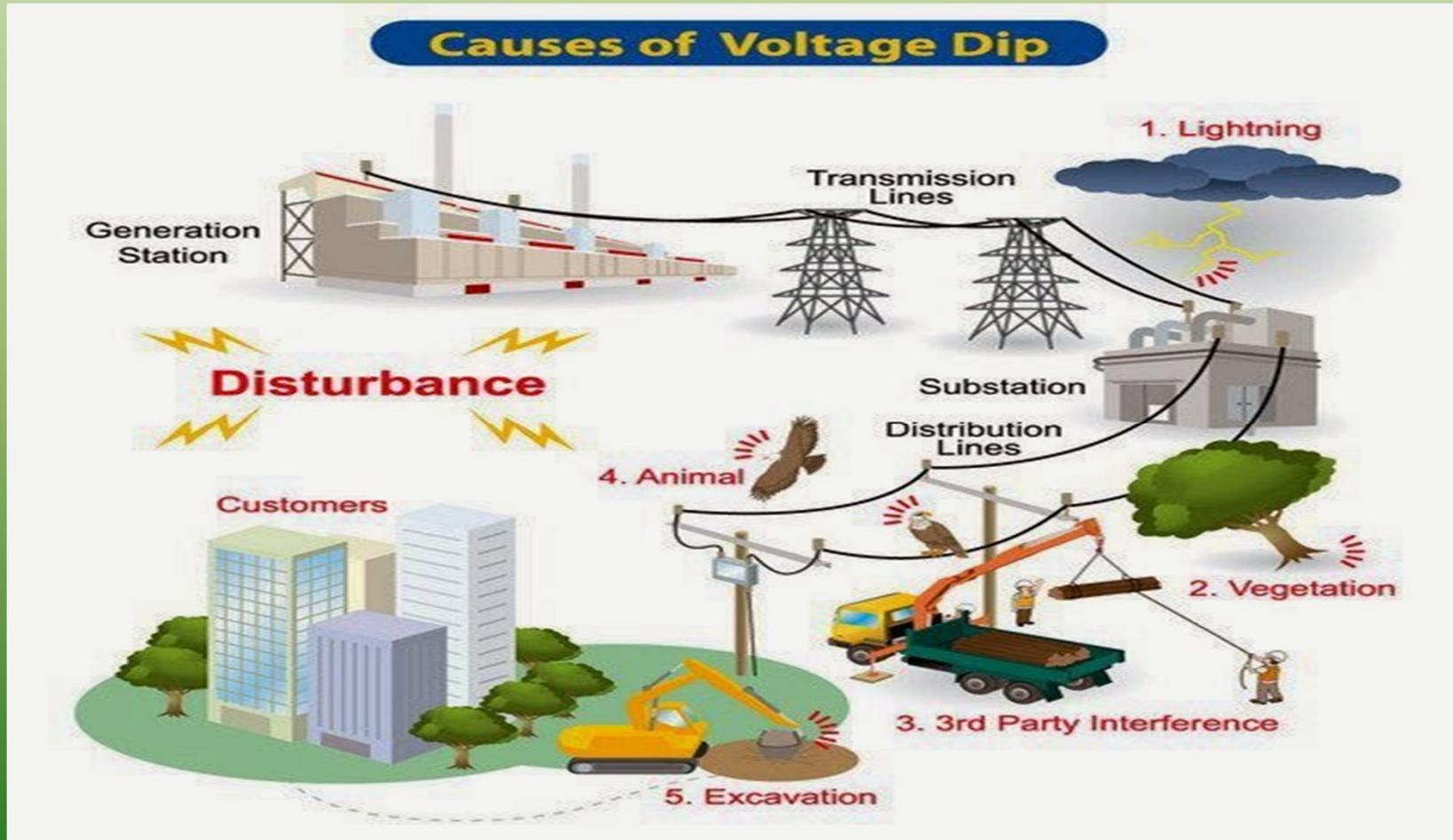
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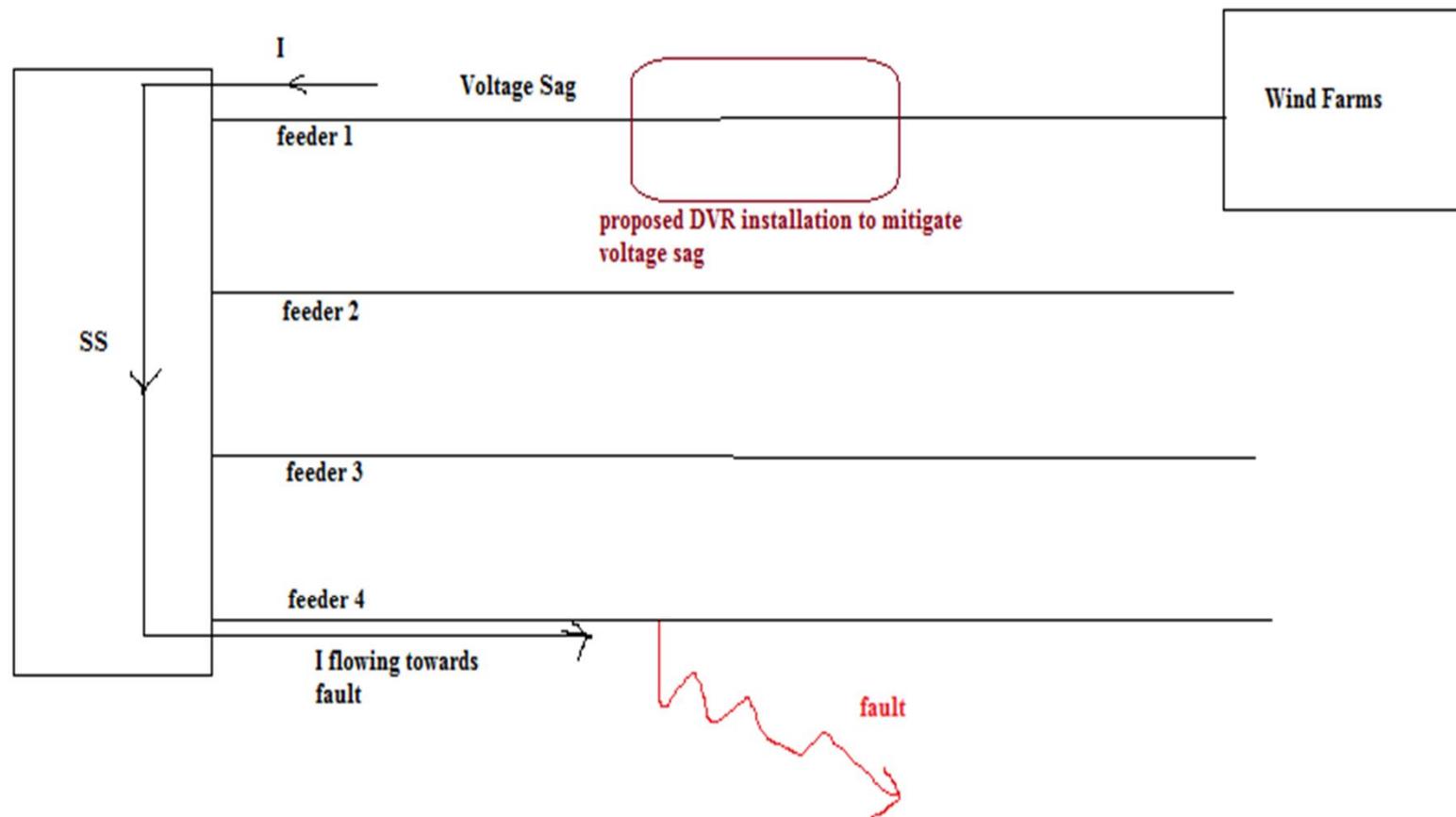
What happens during fault??

- When a fault occurs in one of the grid feeder, the fault current flows to the ground. Supposing, the wind farms are connected to one of the feeder, the fault current starts flowing from the wind farms to the faulty side.
- Therefore voltage starts decreasing. Therefore, this voltage sag might lead to **Islanding**.
- In order to prevent islanding, **the Dynamic Voltage Restorer method** is used to prevent the voltage sag, as mentioned by the grid codes.

Fault!!



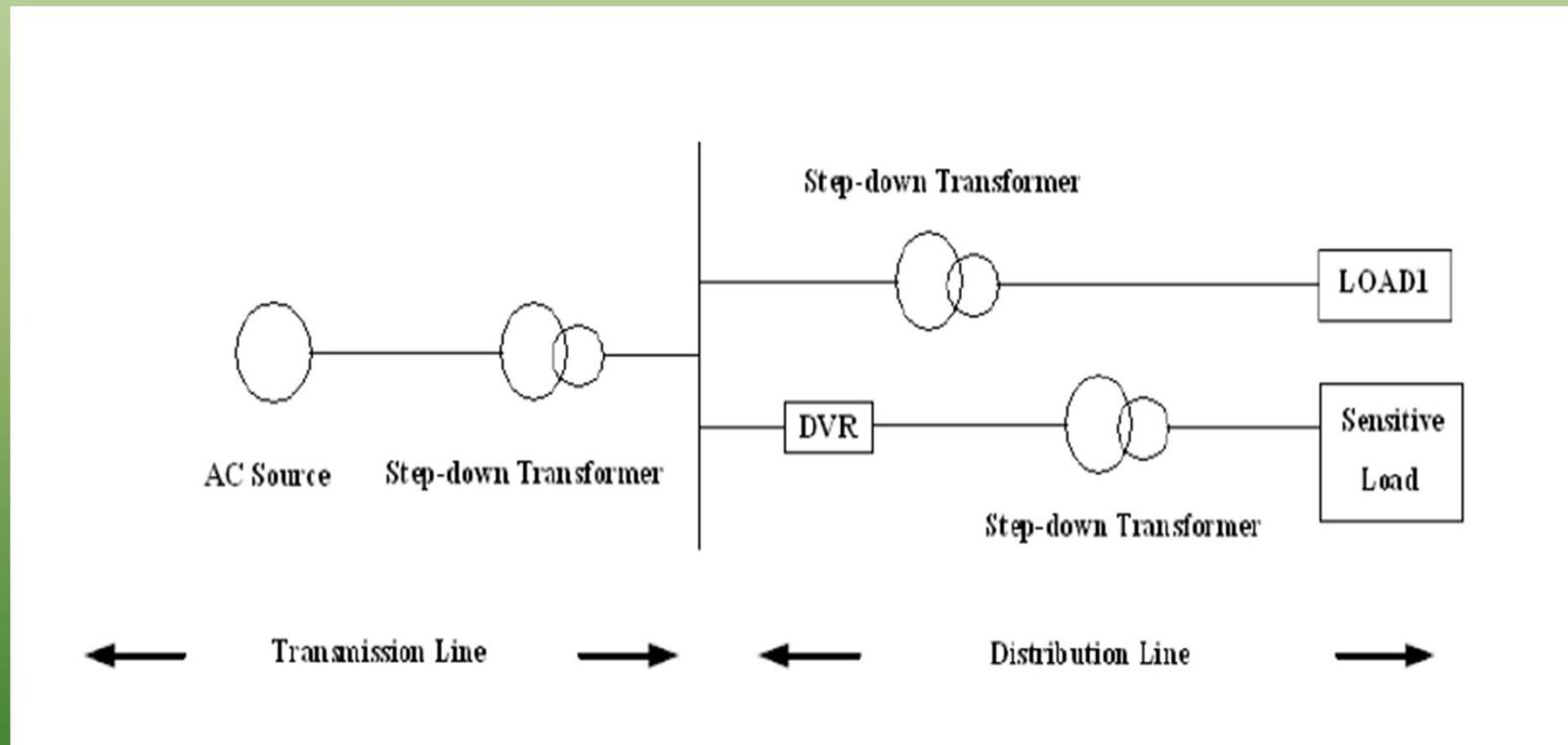
How Voltage sag mitigation prevents Islanding of wind farms?



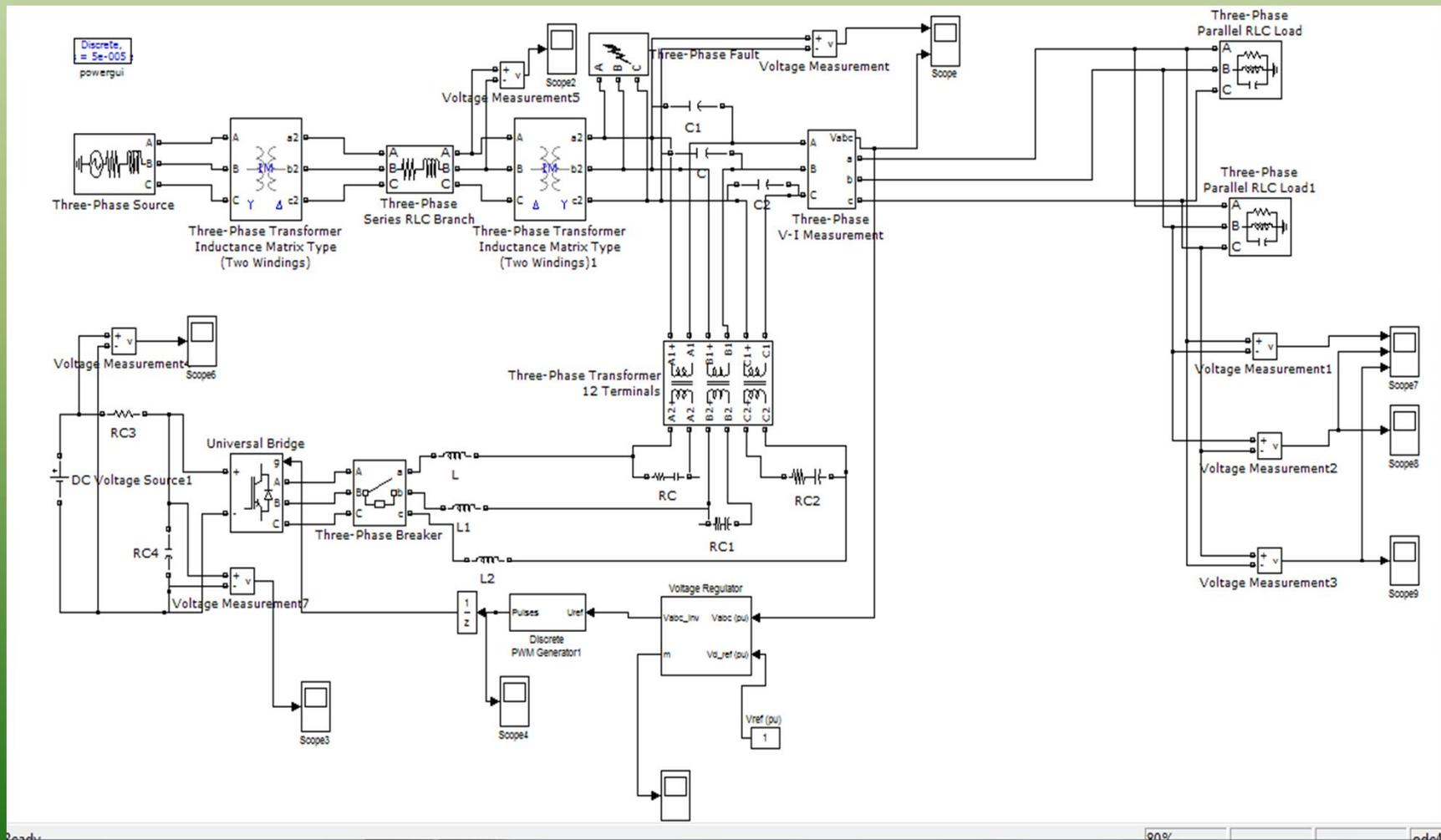
What actually happens??

- The DVR is a dynamic compensation method for absorbing reactive power and correcting the voltage by voltage sag mitigation.
- This will prevent abnormal over voltages during islanding.
- During voltage sag, the DVR injects a voltage to restore the load supply voltages. The DVR needs a source for this energy.
- Two types of system are considered; one using stored energy to supply the delivered power and the other having no internal energy storage, where energy is taken from the incoming supply through a shunt converter.

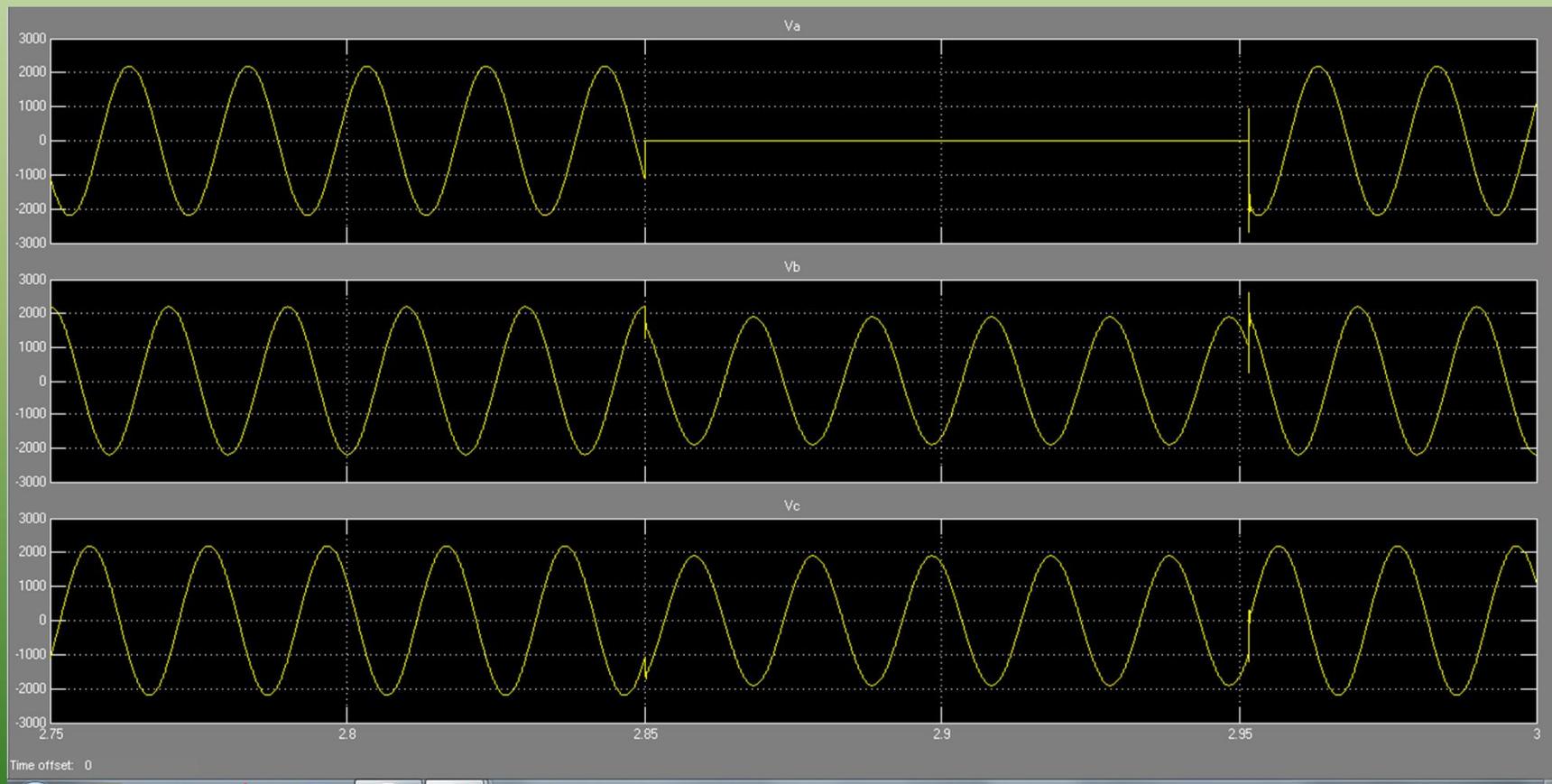
Location of DVR



Simulation Diagram for voltage sag mitigation using DVR



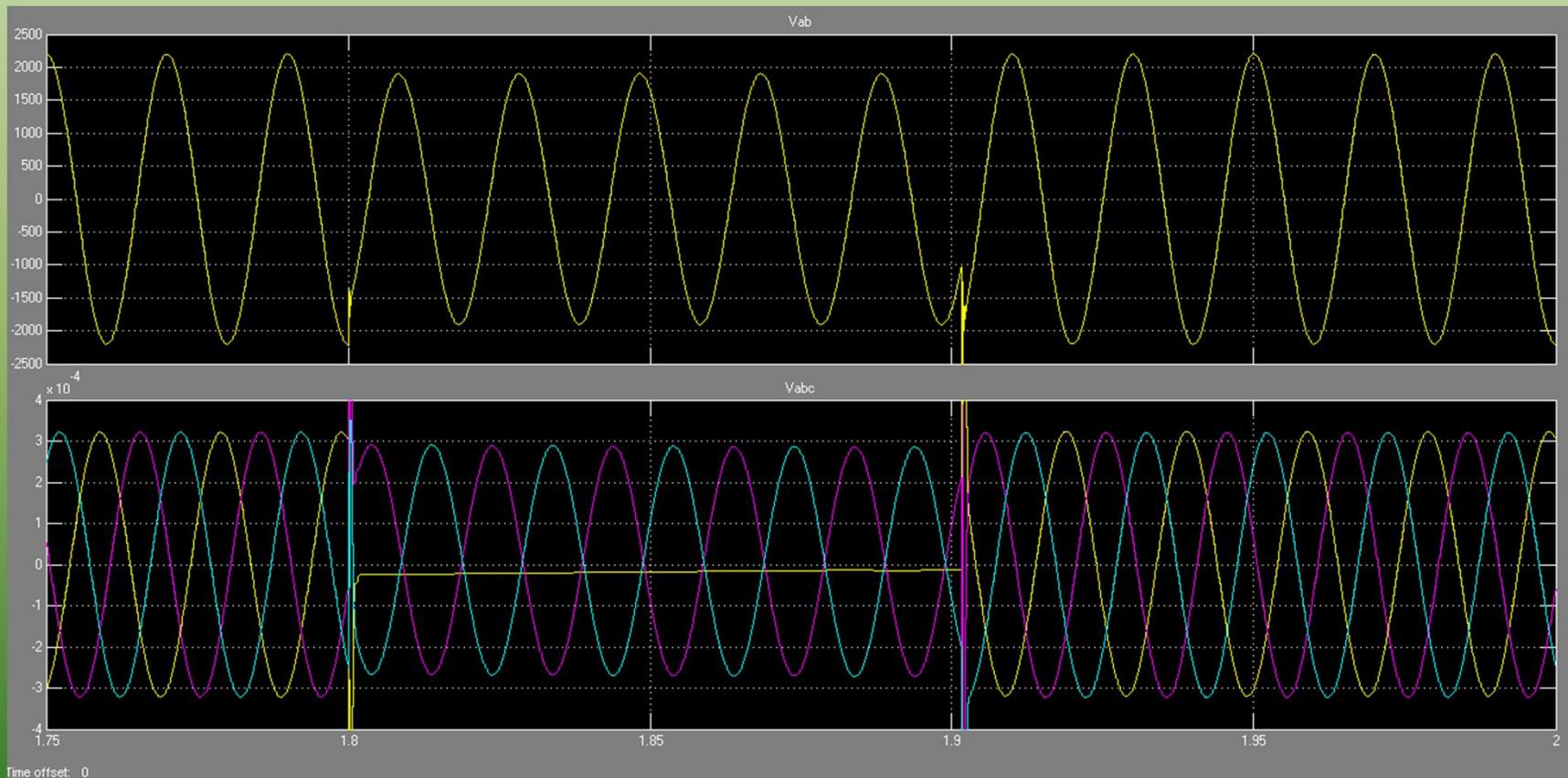
Output during fault condition without DVR



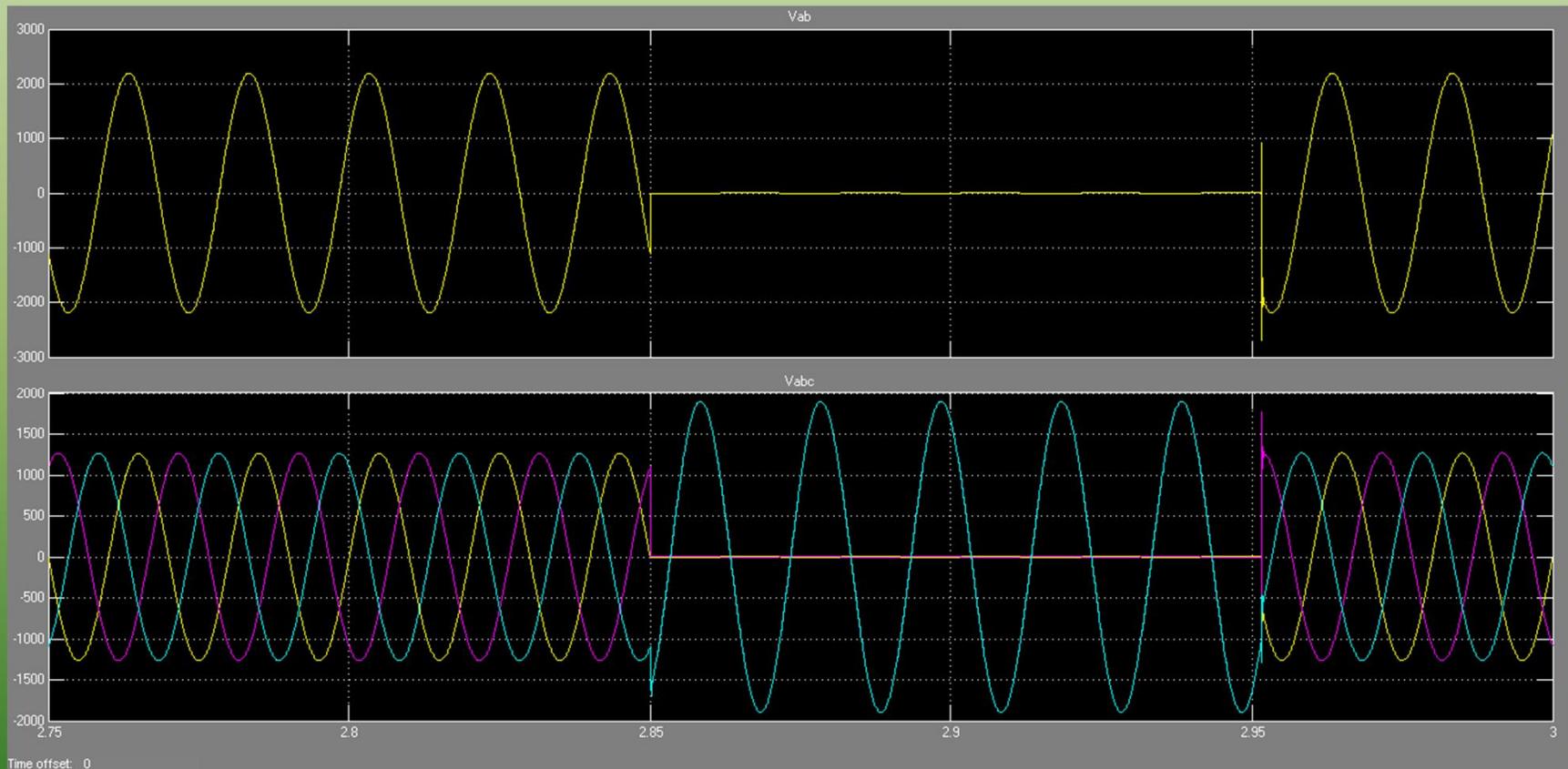
Various Standards for Fault condition

Standard	Definition	Magnitude	Duration	Applicability
EN 50160	Short Interruption	<1%	Up to 3 min	LV and MV (up to 35 kV)
IEEE Std 1159-1995	Momentary interruption	<10%	0.5 cycles to 3 sec	LV, MV, HV
IEEE Std 1250-	Instantaneous interruption	Complete loss of voltage	0.5 cycles to 0.5 sec	LV, MV, HV
	Momentary interruption		0.5 sec to 2 sec	LV, MV, HV

Voltage sag condition

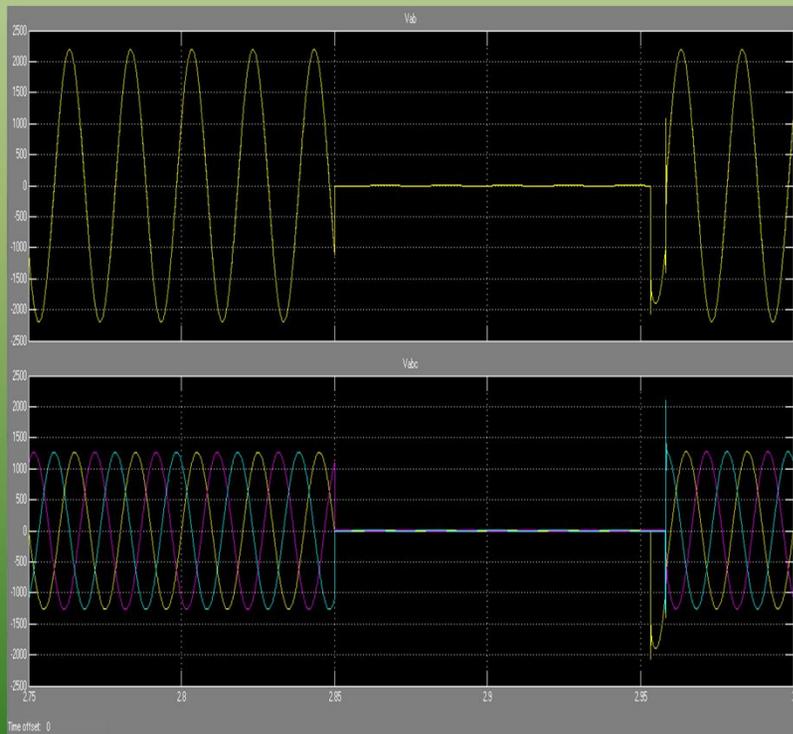


Voltage sag in single phase to ground fault

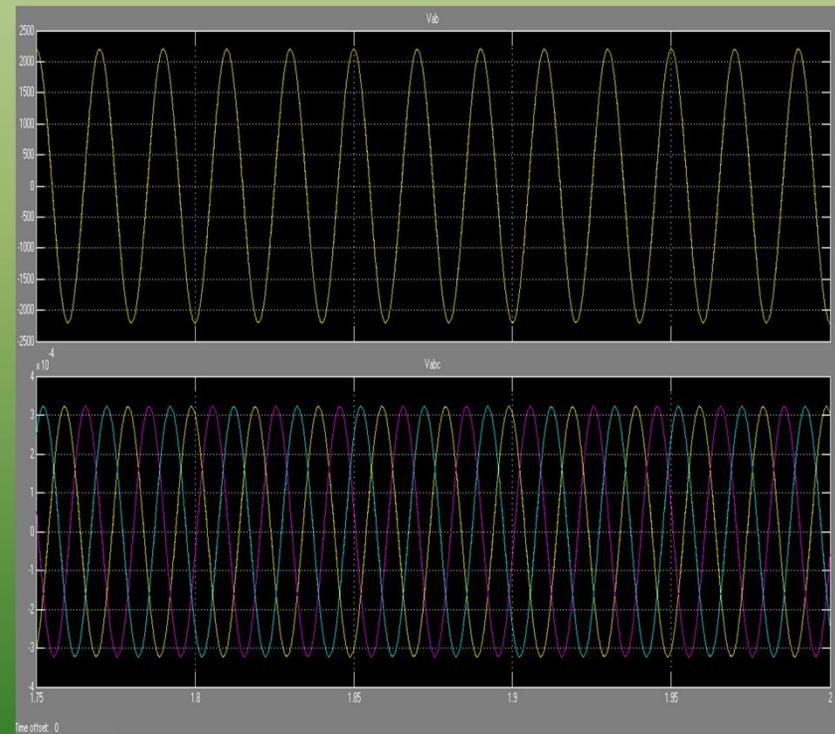


The Simulation results of DVR

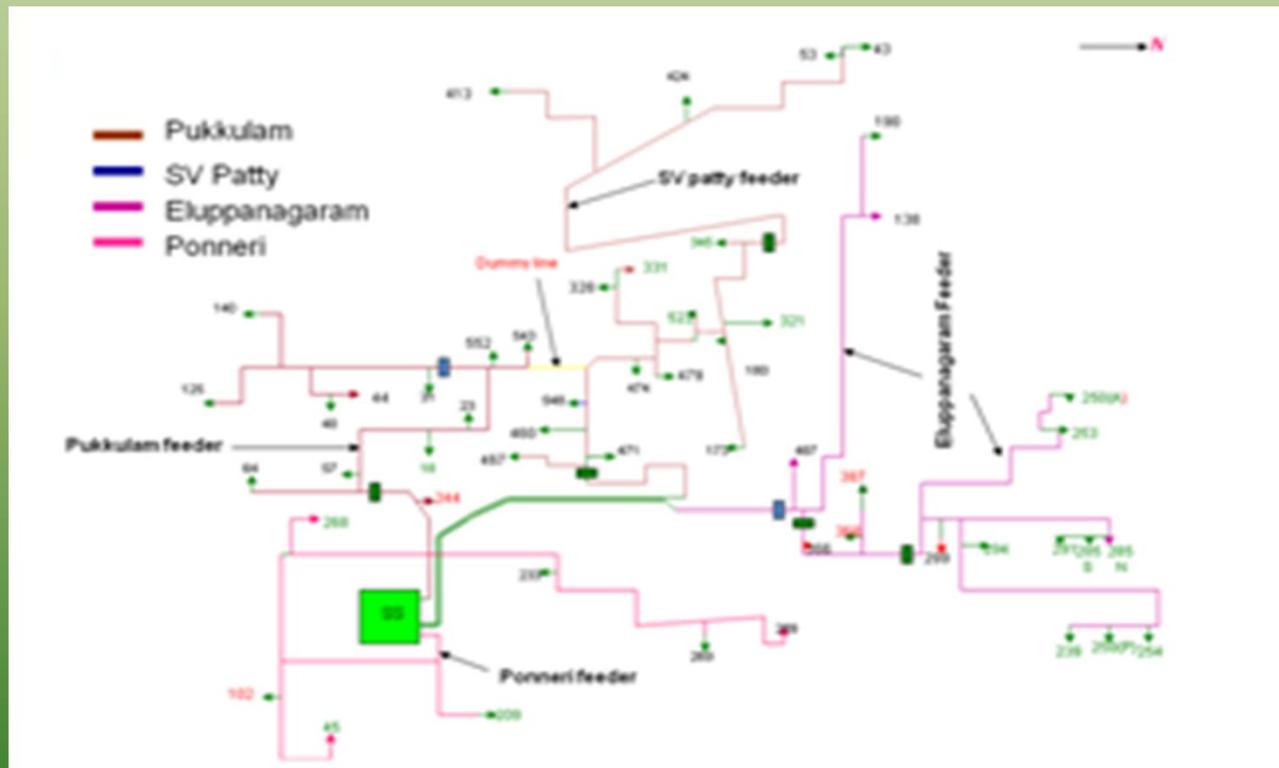
Voltage with sag without DVR



Voltage without sag with DVR



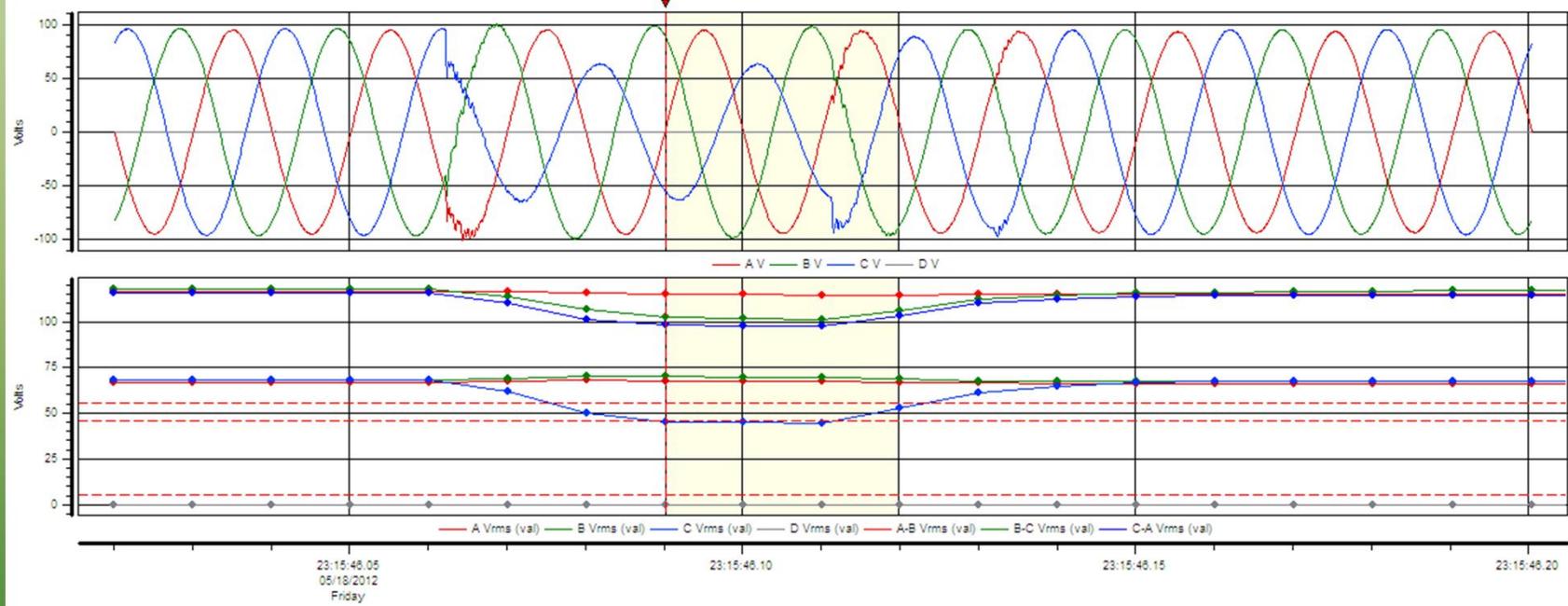
PETHAMPATTY WIND FARM LAYOUT



FIELD DATA SHOWING THE VOLTAGE SAG CONDITION

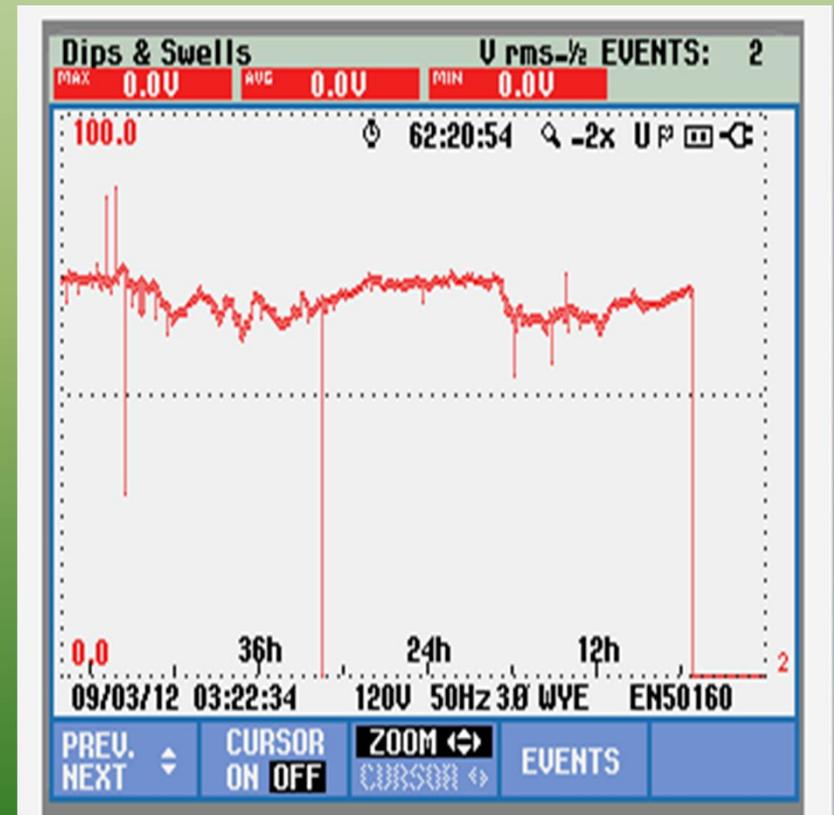
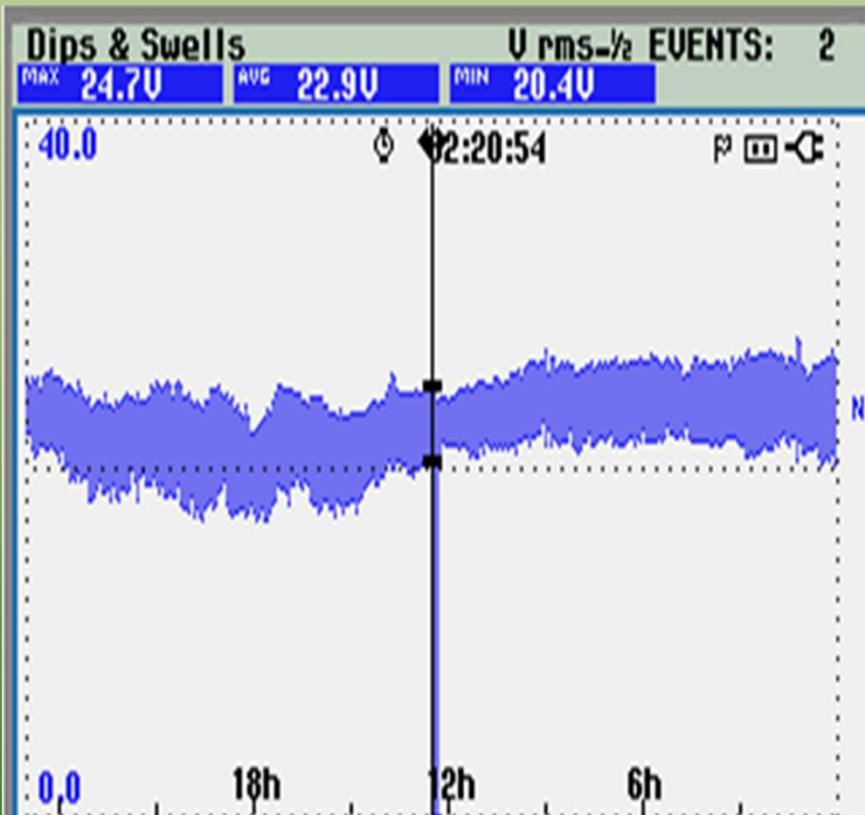
Dran-View 6.8.01 HASP : 1642265135 (61E2D31Fh)

Event Details/Waveforms



Event #14431 at 05/18/2012 23:15:46.090
CVrms Instantaneous Sag
CATEGORY: Short Duration Instantaneous Sag
Threshold crossed 45.61 V
Magnitude 44.65 V
MaxRMS 44.94 V
Duration 0.02992 Sec

Sudden voltage dip due to fault in wind farms





Thank you!!

Queries??