

DATASETS: Development of a real-time testbed for renewable energy integration studies

MATLAB Live script code:

- 1) Automatically determines an RPP's continuously operating voltage and frequency boundaries as given in South African grid code requirements, from where it is imported to the simulation testbed.
- 2) Automatically determines an RPP's High Voltage Ride Through/Low Voltage Ride Through boundaries as given in South African grid codes, from where it is imported to the simulation testbed.

```
clear all

% POC_voltage options%
% 1 = <11kV
% 2 = 11/22/33/44kV
% 3 = 66/88/132kV

% RPP_type options%
% 1 = Cat_A1,A2
% 2 = Cat_A3,B_non-sync
% 3 = Cat_C_non-sync
% 4 = Cat_A3,B_sync
% 5 = Cat_C_sync
% 6 = Cat_A3,B_sync_3-ph_fault
% 7 = Cat_C_sync_3-ph_fault

POC_voltage = '1' ;
RPP_type = '3';

if (POC_voltage=='1')
    Vn1=[0.85] % V normal lower limit
    Vnu=[1.1] % V normal upper limit
elseif (POC_voltage=='2')
    Vn1=[0.9] % V normal lower limit
    Vnu=[1.08] % V normal upper limit
elseif (POC_voltage=='3')
    Vn1=[0.9] % V normal lower limit
    Vnu=[1.0985] % V normal upper limit
else display "unknown parameter"
end

if (RPP_type=='1')
    T1=[0 0.15 0.15001 0.6 0.60001 25]; % Time breakpoints
    V1=[0.6 0.6 0.8 0.8 Vn1 Vn1]; % LVRT voltage
boundaries
```

```

        T2=[0 25]; % Time breakpoints
        V2=[Vnu Vnu]; % HVRT voltage
boundaries

elseif (RPP_type=='2')
    T1=[0 0.15 2 20 20.00001 25]; % Time breakpoints
    V1=[0 0 0.85 0.85 Vn1 Vn1]; % LVRT voltage
boundaries
    T2=[0 25]; % Time breakpoints
    V2=[Vnu Vnu]; % HVRT voltage
boundaries

elseif (RPP_type=='3')
    T1=[0 0.15 2 20 20.00001 25]; % Time breakpoints
    V1=[0 0 0.85 0.85 Vn1 Vn1]; % LVRT voltage
boundaries
    T2=[0 2 2.00001 25]; % Time breakpoints
    V2=[1.2 1.2 Vnu Vnu]; % HVRT voltage
boundaries

elseif (RPP_type=='4')
    T1=[0 0.15 0.15001 2 20 20.00001 25]; % Time breakpoints
    V1=[0 0 0.5 0.85 0.85 Vn1 Vn1]; % LVRT voltage
boundaries
    T2=[0 25]; % Time breakpoints
    V2=[Vnu Vnu]; % HVRT voltage
boundaries

elseif (RPP_type=='5')
    T1=[0 0.15 0.15001 2 20 20.00001 25]; % Time breakpoints
    V1=[0 0 0.5 0.85 0.85 Vn1 Vn1]; % LVRT voltage
boundaries
    T2=[0 2 2.00001 25]; % Time breakpoints
    V2=[1.2 1.2 Vnu Vnu]; % HVRT voltage
boundaries

elseif (RPP_type=='6')
    T1=[0 0.15 0.15001 2 20 20.00001 25]; % Time breakpoints
    V1=[0.3 0.3 0.5 0.85 0.85 Vn1 Vn1]; % LVRT voltage
boundaries
    T2=[0 25]; % Time breakpoints
    V2=[Vnu Vnu]; % HVRT voltage
boundaries

elseif (RPP_type=='7')
    T1=[0 0.15 0.15001 2 20 20.00001 25]; % Time breakpoints

```

```

    V1=[0.3 0.3 0.5 0.85 0.85 Vn1 Vn1];    % LVRT voltage
boundaries
    T2=[0 2 2.00001 25];                    % Time breakpoints
    V2=[1.2 1.2 Vnu Vnu];                    % HVRT voltage
boundaries

else display "unknown parameter"
end

plot(T1,V1,T2,V2);
title('VRT requirements of selected RPP')
xlabel('Time')
ylabel('Voltage')
legend('LVRT limit','HVRT limit')

```