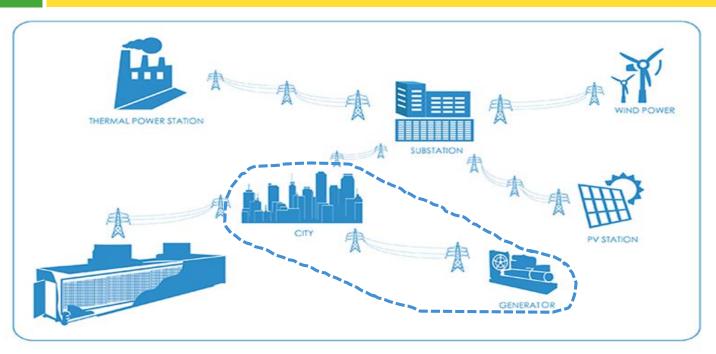


SYNCHROPHASOR ANTI-ISLANDING SCHEME

Introduction of Islanding



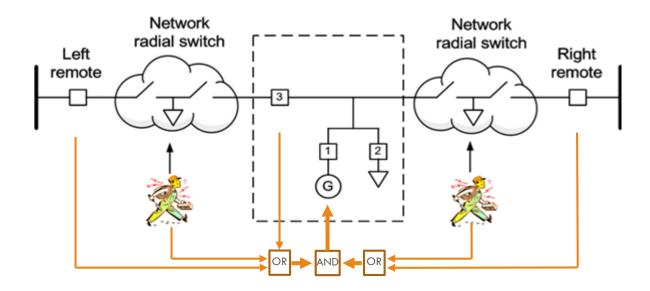
Frequency

Voltage

Reconnection

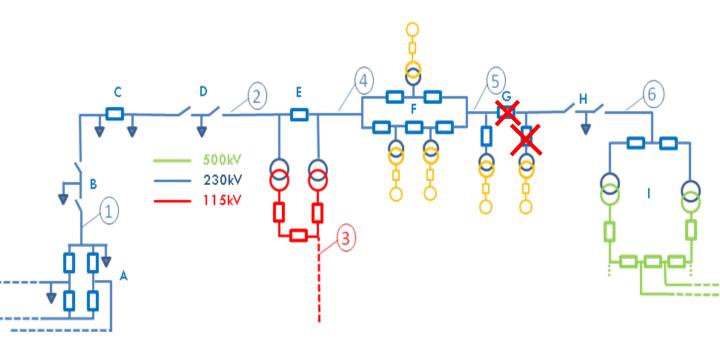


Existing Anti-islanding Scheme





Anti-islanding Scheme Area



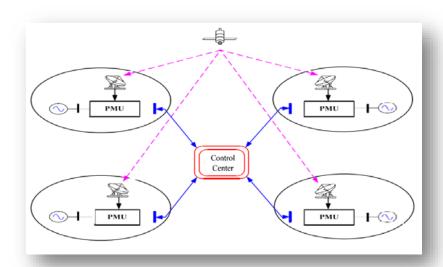


Introduction of Synchrophasors

■ Report rate 30Hz

Accurate time tag

Phasor measurement





Real Time Digital Simulator (RTDS) Features

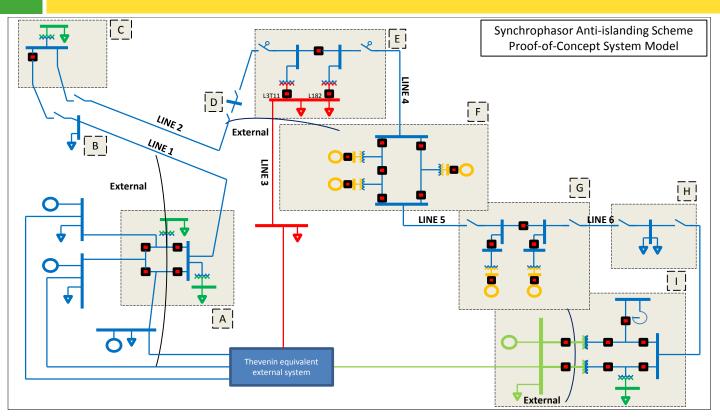
■ RTDS is a multiprocessor system that is optimized to perform power system simulations in real time.

- The simulation speed of RTDS is very fast.
- RTDS has numerous dedicated, high speed digital and analog I/O interface.

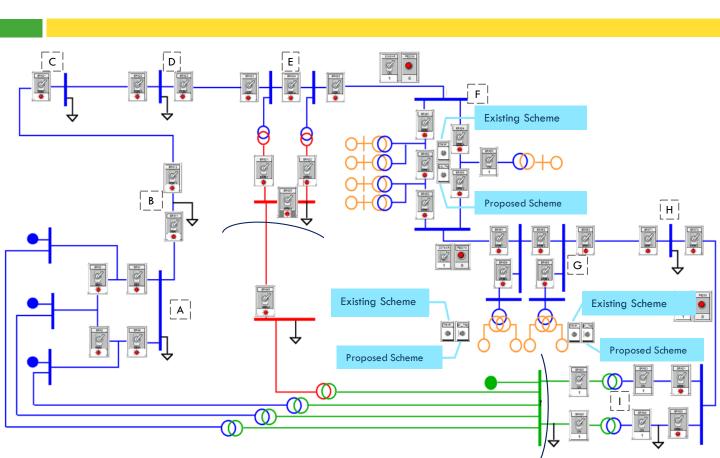




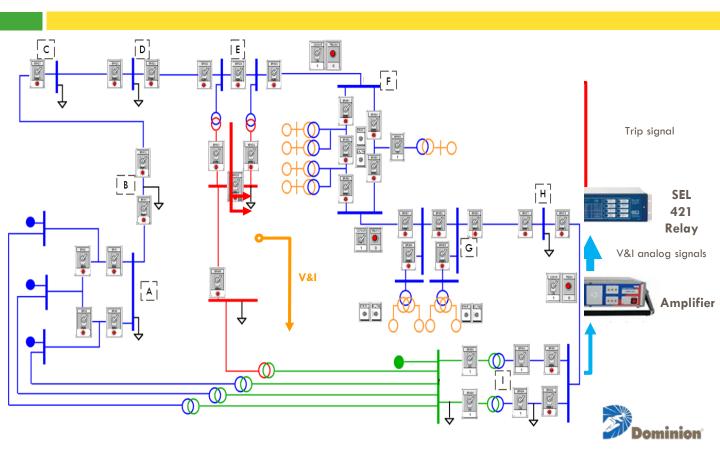
Test Bed System Model



Testing Proposed Anti-islanding Scheme with RTDS/RSCAD



RTDS Hardware-in-the-Loop with Relay



Islanding Detection Using Synchrophasors

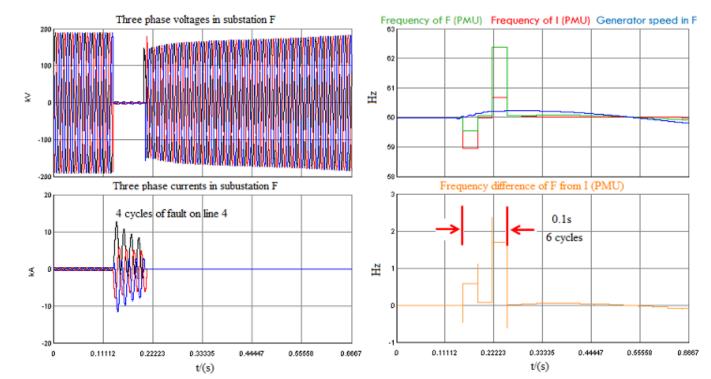
- Existing islanding detection method
- Prone to human errors
- Does not tolerate sustainable islanding
- Proposed islanding detection using PMUs to monitor:
 - Line currents
 - Rate of change of frequency (ROCOF)
 - Frequency deviation

	Breaker/switch signal is closed	Breaker/switch signal is open
Line Current > Threshold	Normal	Breaker/signal is wrong
Line Current <= Threshold	Unknown	Islanding

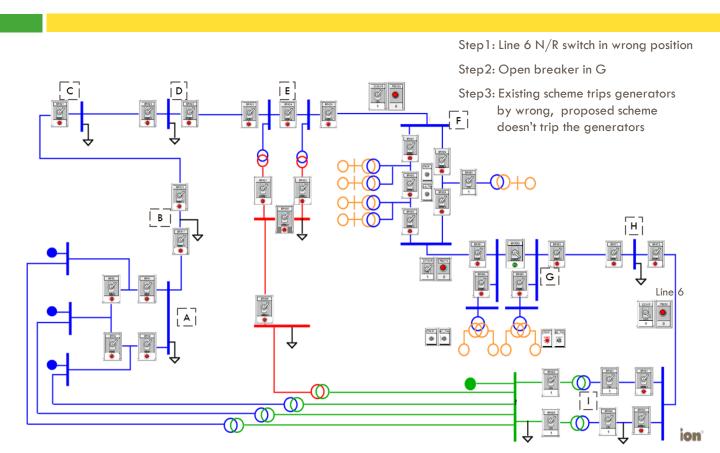


Frequency Deviation Threshold

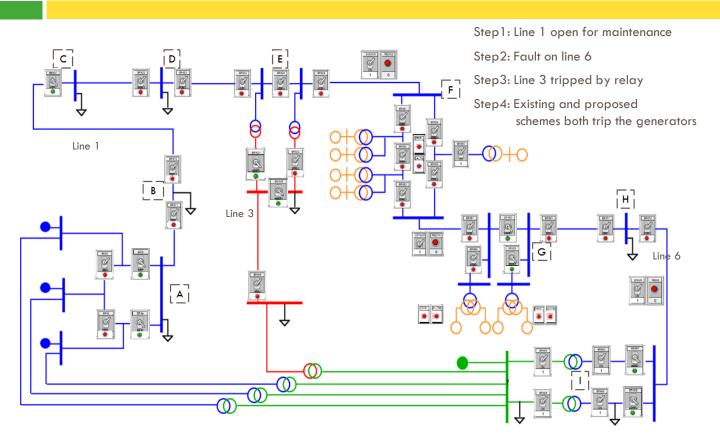
Frequency deviation threshold 1Hz and time delay of 0.1s



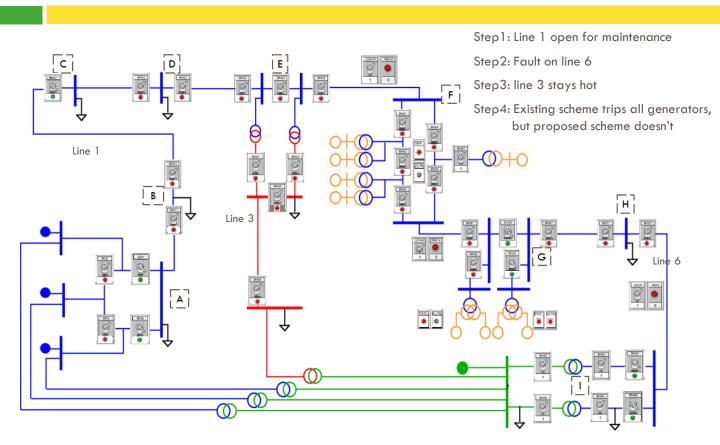
Test Results of Human Error Case



Test Results of Islanding Case



Test Results of Curtailed Generation Case



Islanding Detection Results

		Existing scheme detection results	Proposed scheme detection results
o F	Human error	Wrong	Correct
2	ine 3 is tripped after both 230kV sides are disconnected	Correct	Correct
	ine 3 not tripped after both 230kV sides are disconnected	Wrong	Correct
	•	:	:



Summary

Application of synchrophasor data in anti-islanding scheme helps to improve detection accuracy and improve system stability

- ✓ Avoid wrong tripping caused by inaccurate breaker/switch status
- ✓ Consider the sustainability of line 3

Future work

- Threshold setting to cooperate with reclosing
- Model the renewable energy integrated at distribution level
- Field test

