



# Recent Developments

October 2020



RTDS.COM

# GBH v3

- Base unit has 36 channels
- Expandable to up to 144 channels



# GTNETx2 Development

## ➤ GTNET-MODBUS

- Modbus protocol added
- Slave operation
- TCP, RTU over TCP, ASCII over TCP
- Response time < 10ms

## ➤ GTNET-104 and DNP

- Double point status and control
- Support added for connection to up to 4 Master Stations
- Enhancements will be added to DNP

## ➤ GTNET-SKT

- Support added for connection to up to 10 external connections with different IP addresses



# GTNETx2 Development

## ➤ GTNET-GSE v6

- IEC 61850 Edition 2
- XCBR/XSWI outgoing GOOSE dataset
- IEC 61850 MMS Server
- Routable GOOSE (R-GOOSE, IEC 61850-8-1 Ed2.1 / IEC 61850-90-5 TR)

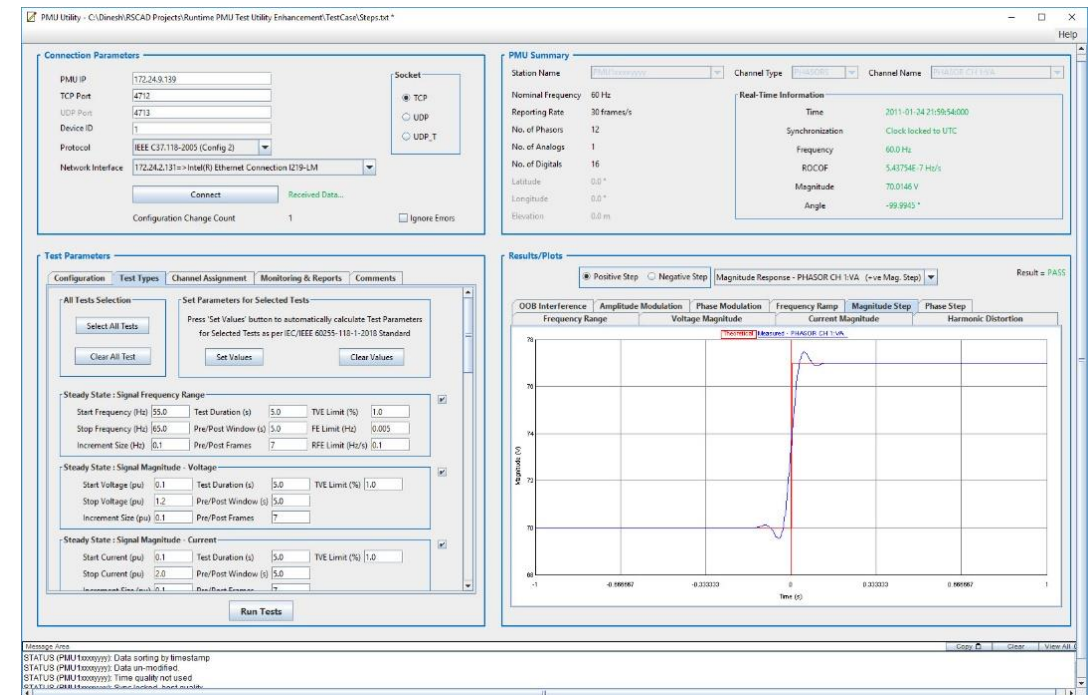
## ➤ GTNET-GSE v7 (ongoing dev.)

- Allowing configuration of generic GOOSE messages from GTNET2 (beyond GGIO)
- Load information for GOOSE messages from SCD file to mimic different IEDs



# PMU Utility Enhancement (ongoing)

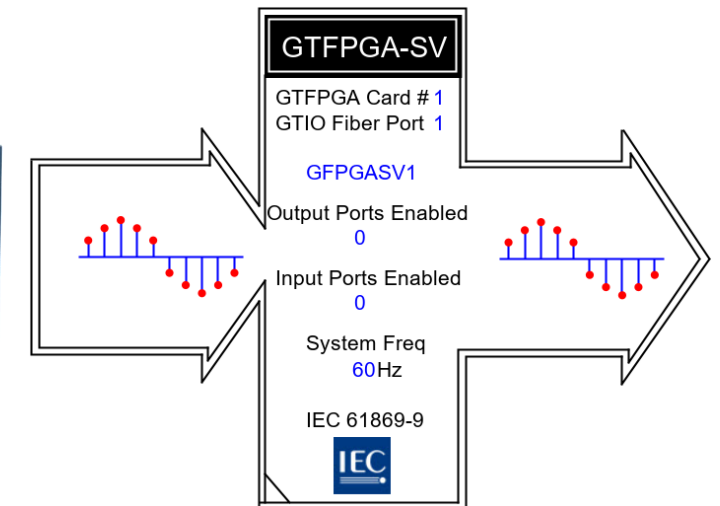
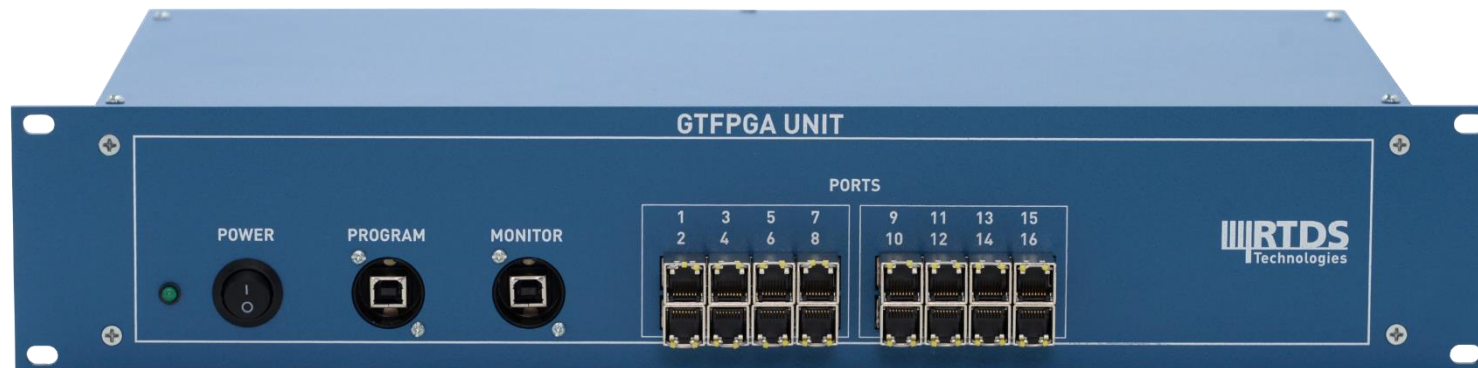
- New Graphical User Interface to replace the script functionality
- Complies for the requirements of the latest synchrophasor standard (IEC/IEEE 60255-118-1 : 2018) and IEEE Synchrophasor Measurement Test Suite Specifications (version 3 – expected to be published soon)
- Some new features –
  - Option to select performance class (P- or M-class)
  - A calculation block/function to calculate maximum TVE, FE and RFE for each steady-state and dynamic performance test
  - A calculation block/function to calculate response time, delay time, and maximum overshoot or undershoot for the dynamic step response test
  - A function to check conformity (pass/fail assessment) and generate complete test reports



# GTFPGA-SV v3

## ➤ Substep / small timestep

- Full-duplex Mode (mainstep) - Publishes and **subscribes** up to 16 streams (1 stream/port) **simultaneously**
- Supports Substep for 96kHz and **250kHz publisher**
- Supports 1 stream with up to **48 data channels** in 1 ASDU at **250kHz**





# PHIL Simulation

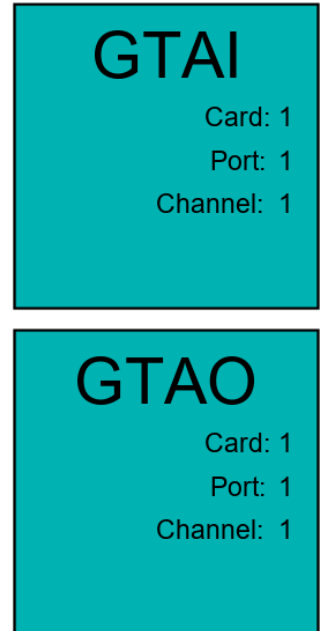
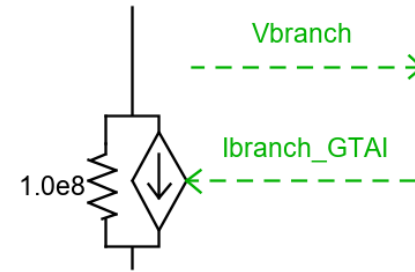
- Added component to interface digitally to Egston's COMPISO amplifier units
- Interface via GTFPGA Unit (unlike direct fibre cable implementation for SPS amplifiers)
- Current sources embedded within the model for ease of use



# PHIL Simulation

## ➤ Conventional Interface for PHIL Simulation

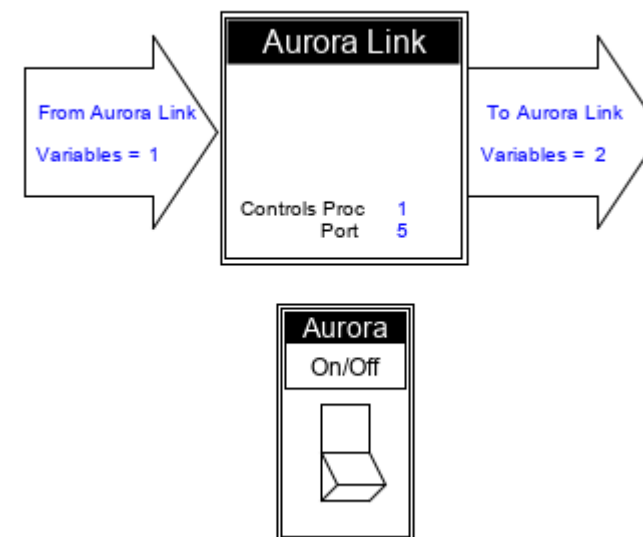
- Component with conventional GTA0 and GTAI plus current source embedded
- Optimized timing for data exchanges to further reduce loop delay (loop delay is less than  $\Delta t$ )





# Aurora Protocol Enhancements

- Maximum number of variables for one channel increased from 64 to 128
- Total max number of variables for one chassis still the same as previous; 256
- Added component which allows enable/disable of Aurora channels dynamically in RunTime without timestep overflow



# Usage Logging Feature

- Enable via RSCAD “Tools” menu
- Automatically records simulation start/stop times, duration, user’s IP address, case name
- May help customers looking to justify simulator upgrades based on usage, or generally track/schedule usage

Database Logging Connection Settings

Database Logging Connection Settings Help

Enable database logging of run Start/Stop times (Default: false)

localhost Host Name / IP Address (Default: localhost)

3306 Database port number on server (Default: 3306)

rtdsUsageLogger Database Username (Default: rtdsUsageLogger)

Database Password (Default: null) Set

rscad\_logs Database Schema Name (Default: rscad\_logs)

SQL Database/Table Code

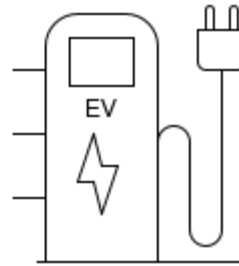
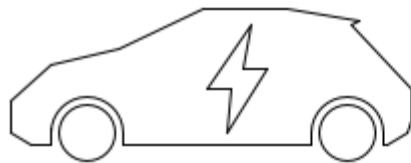
Test Database Connection

OK Cancel

	run_start	run_stop	run_duration	case_filename	computer_username
▶	2019-10-03 09:40:43	2019-10-03 09:40:47	4837	HVDCLIGHT3	hm
	2019-10-03 09:41:45	2019-10-03 10:05:54	1449279	HVDCLIGHT3	hm

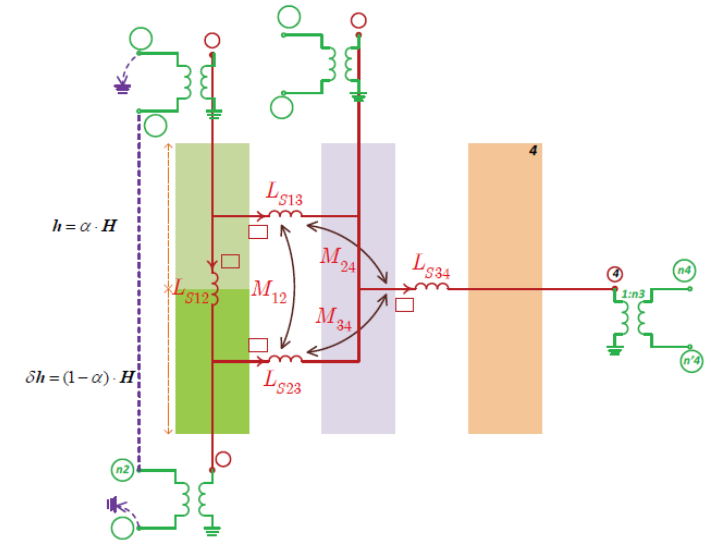
# EV and Charging Station Simulation

- New component appearance
- Added bidirectional power support for EV
- Charging station is a controlled load that draws active and reactive power from the power system



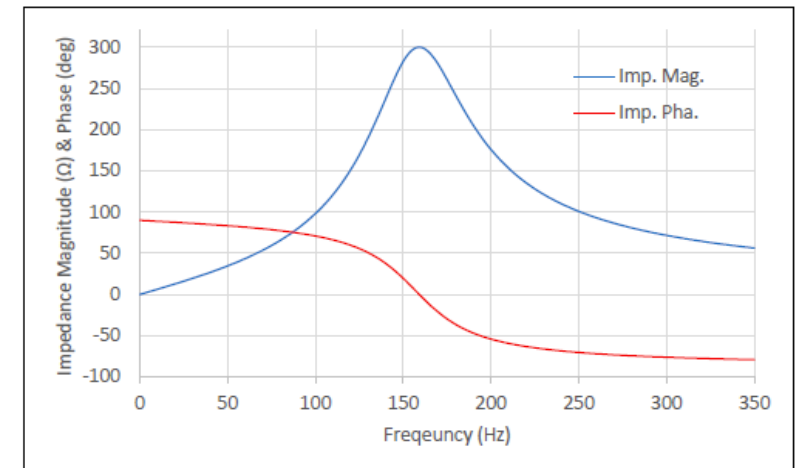
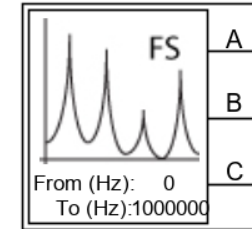
# New faulted transformer model (terminal duality approach)

- Industry leading approach to real-time transformer simulation
- More realistic representation than popular star equivalent circuit
- More accurate prediction of inrush current, short circuit reactance
- Represents mutual coupling between branches of equivalent and takes transverse component of leakage flux into account
- Monitor I & V of faulted windings



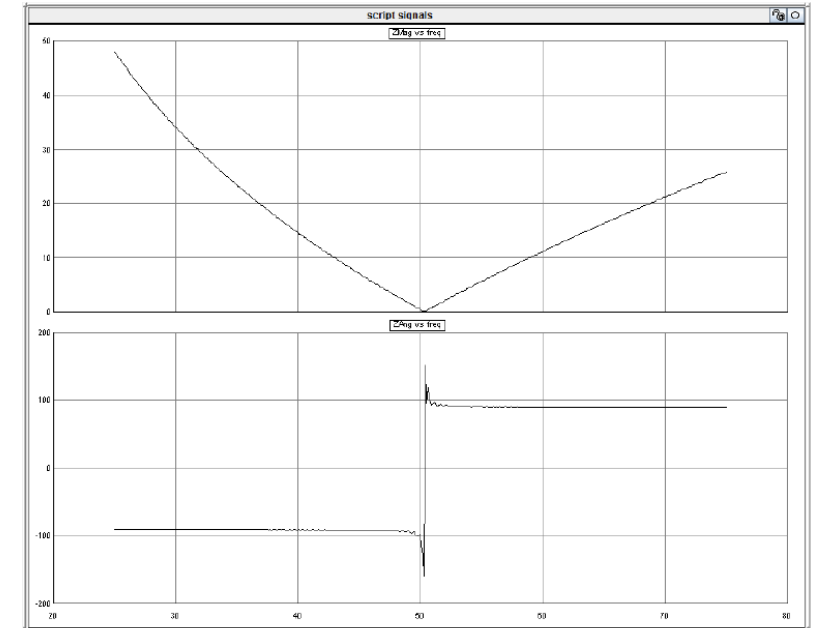
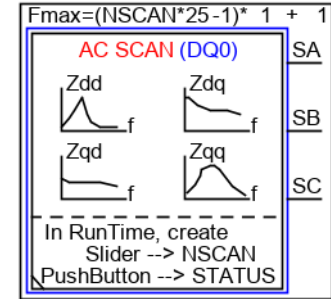
# Frequency scan component

- Analytical, offline impedance scan of simulated network
- Done via Draft module prior to running simulation
- User specifies frequency range between DC and 1MHz
- Writes system impedance seen from scanning point to file
  - Lower triangular portion of phase impedance matrix
  - Pos., neg., zero sequence impedance
  - D-, q-, 0-axis impedance
  - Modified sequence quantities (PN0) good for high penetration of power electronics



# Harmonic scan capability

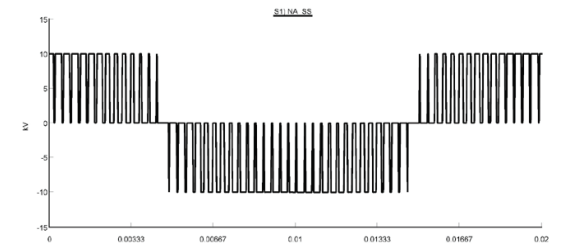
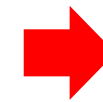
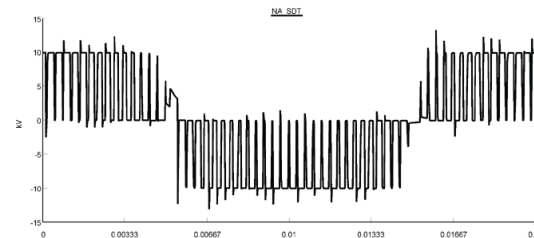
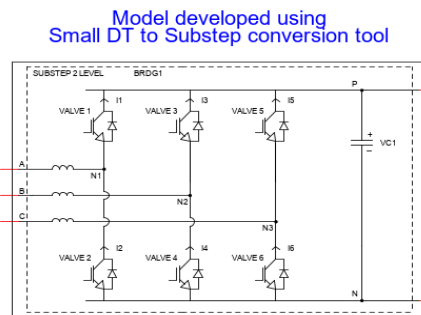
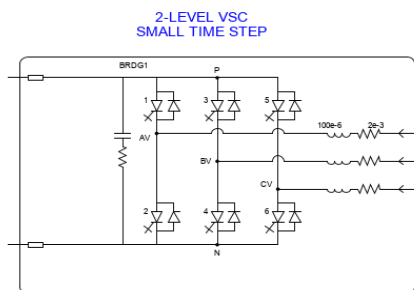
- Component injects small-magnitude white noise to the system
- Online calculation of impedance response in frequency domain
- User specifies frequency range and interval (up to 9 kHz)
- Controlled by script in RunTime
- Outputs DQ0 or PN0 domain impedance
- Future capability to determine Nyquist stability criterion based on eigenvalues





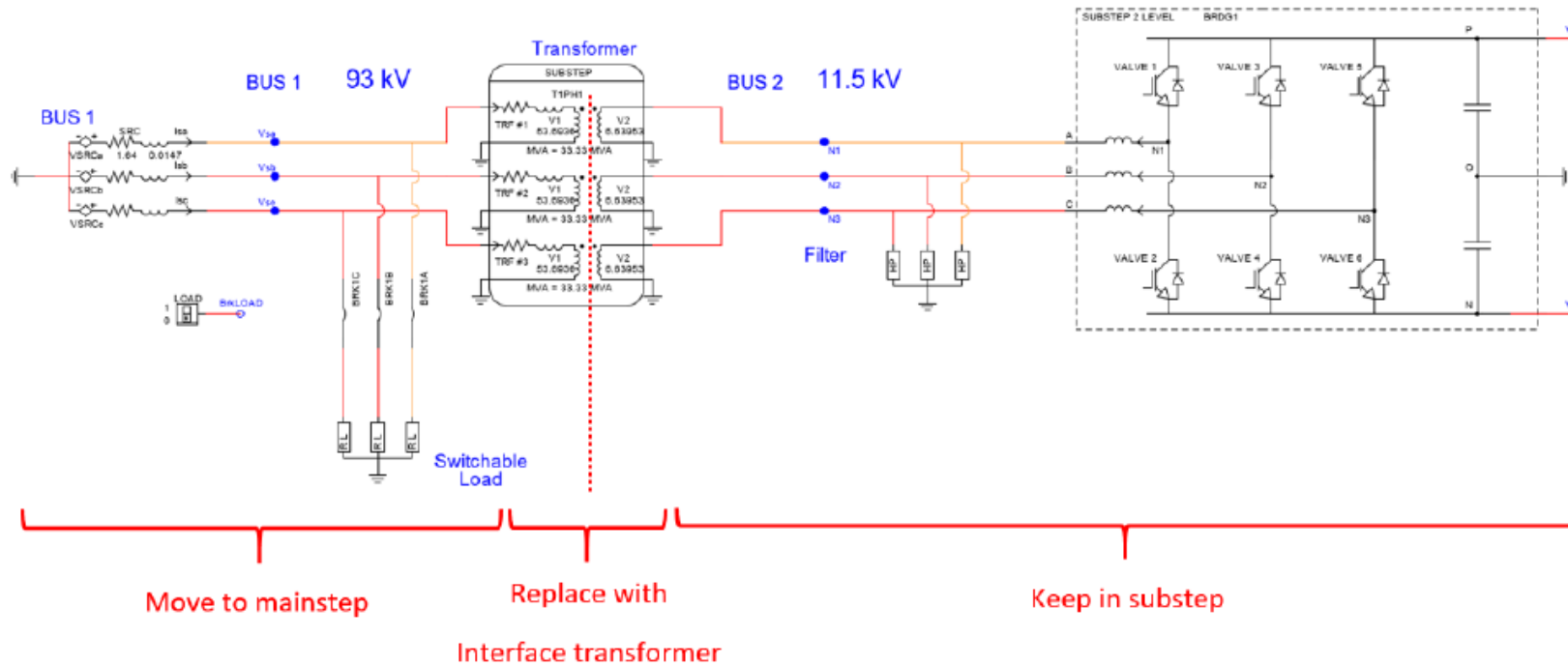
# Small dt to Substep Conversion Tool

- Mismatching graphics or parameters flagged in warning message
- Remember the advantages of Substep
  - No hard limit on resistive switches
  - Avoid fictitious losses without decoupling VSCs
  - Cleaner waveforms (less noise)
  - More nodes per subnetwork



# Substep tutorial

- Manual and cases now available
- Table outlining differences between small dt and substep

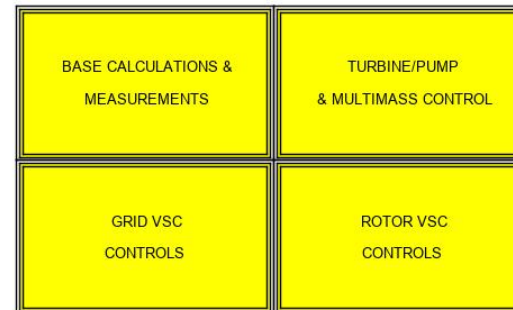


# Flywheel and Pumped Storage sample cases

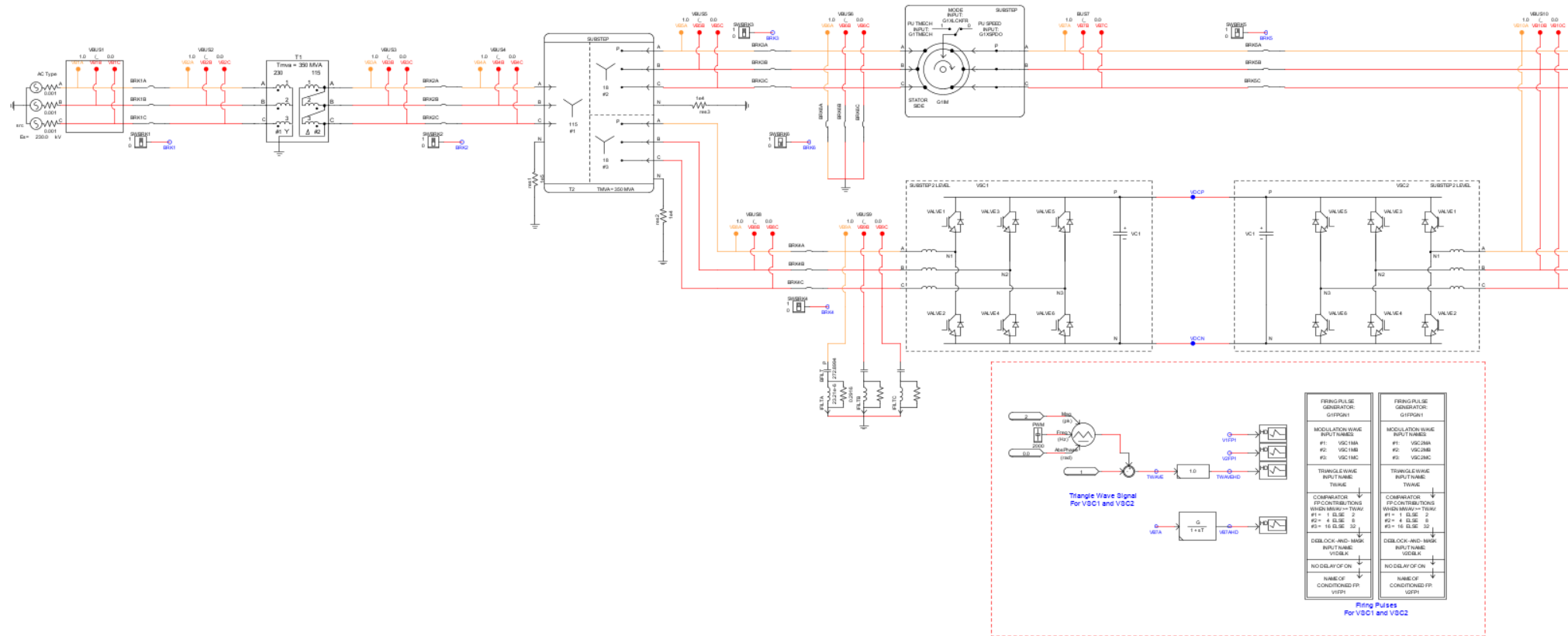
- Fully documented
- Pumped hydro based on variable-speed DFIM system
- Flywheel is addition mass added to rotor of PMSM
- Machine, converters, PWM firing pulse generators in Substep
- AVM versions of cases also available (less simulation hardware)



300 MW VARIABLE SPEED  
PUMPED HYDRO STORAGE

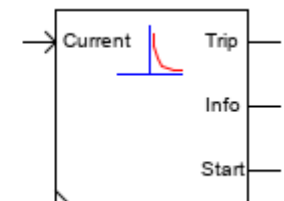
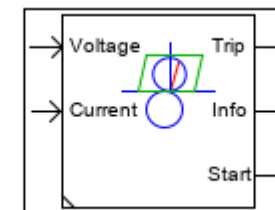
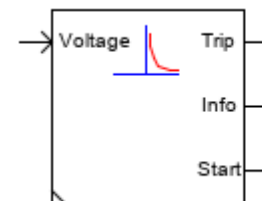
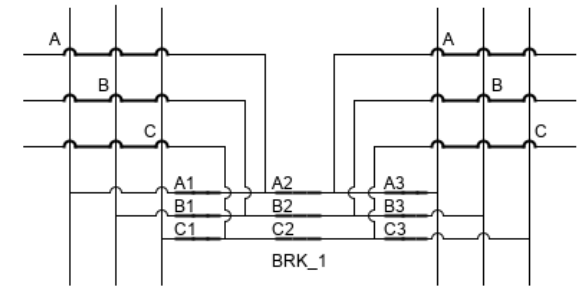
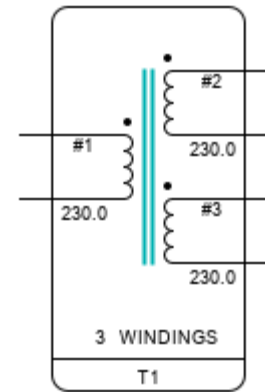


# Flywheel and Pumped Storage sample cases



# Other New Developments in RSCAD

- Multi-winding terminal duality transformer
- Exciter Model AC7C
- 3/2 bus connection for breaker and a half
- Single-phase relaying components
- New version of MMC generic model with multiple internal faults
- Phase-shifted and multicarrier-based PWM generators





**Thank you!**

**For more details, please contact  
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