ETAP Transient Stability
Validation Cases and Comparison Results

Case No. 3
Post-Fault System Transient Response

ETAP TS V&V Case Number: TCS-TS-295

Comparison with Field Measurements from a Fault Recorder

Highlights:

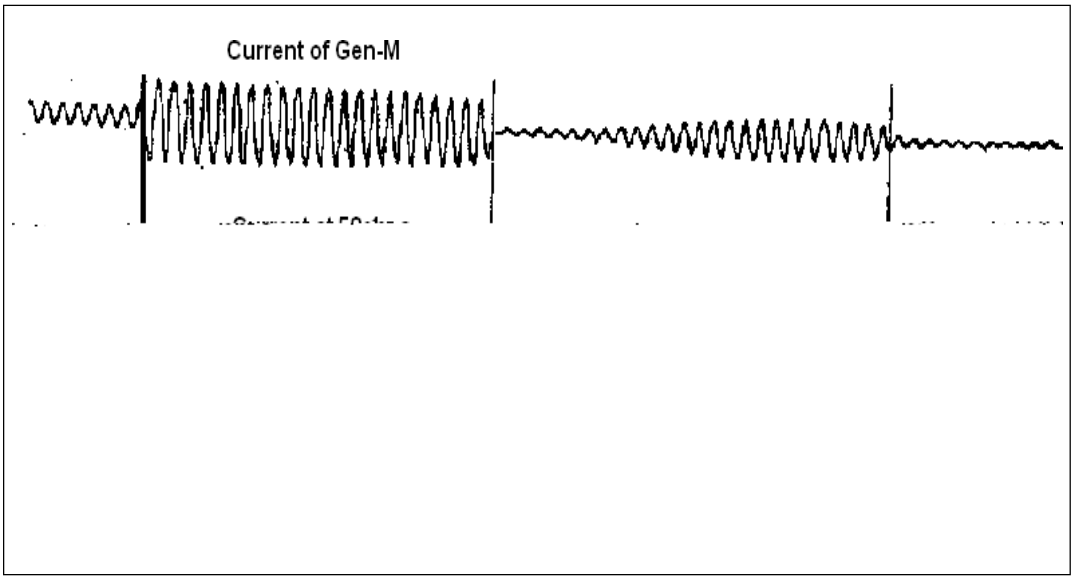
- Comparison between the ETAP Transient Stability simulation results and actual fault-recorder measurements before and after a three-phase fault in an industrial system
- A post-fault system transient response simulation study for a real industrial power system
- Simulation of 3-phase fault, followed by fault isolation and then a generator trip
- System includes multiple voltage levels, a power grid connection, on-site generators, motors, and lumped loads
- ETAP built-in round-rotor subtransient synchronous machine model
- ETAP built-in IEEE ST type turbine/governor model
- ETAP User-Defined Dynamic Model (UDM) for client excitation/AVR model
- ETAP Transient Stability simulation results compared to the filed fault recorded instantaneous waveforms including generator current and voltage, and a feeder fault current

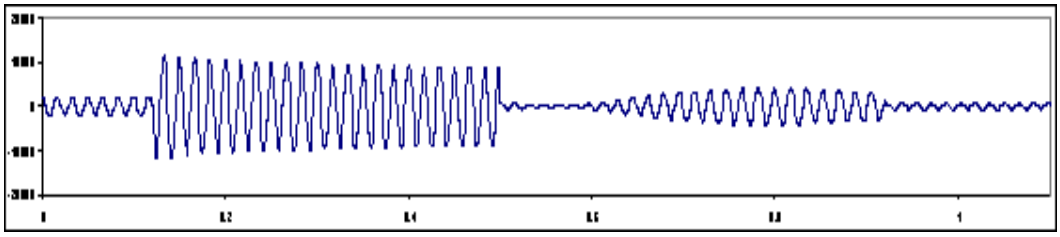
1. System Description

The modeled system, shown in Figure 1, is an actual industrial power system located in Japan. This system has four generators, five large pumps, and one utility connection. All other loads are modeled as

3. Simulation Result Comparisons with the Field Measured Data

In this study, the instantaneous values of the generator current contribution to the fault and its terminal voltage, and the fault current from the feeder upstream to the fault (through CB 521) are compared against the field measured data which is obtained from a digital fault recorder (DFR), as shown in Figure 3. For the comparison, RMS value results from ETAP are converted to the corresponding instantaneous values based on the RMS magnitude, frequency, and phase angles of the currents and vo(M)-1 (S)1 ((eo)1 (u9g(e)-1 (c)s(c)1-0.9 (o1 ((e,)49.1 (nd p2[(F)3 (o)2 (r th)-





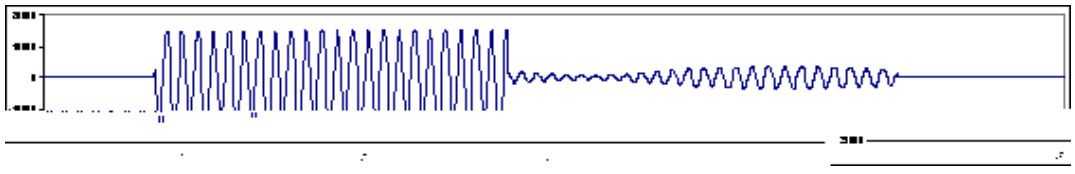


Fig. 6. Generator Gen-M Instantaneous Voltage by ETAP

From the comparison, the generator current and voltage responses as well as the feeder fault current response demonstrate a very close agreement with the field recorded data. A slight difference in generator and feeder currents during a short period of time immediately after opening CB-52