HVDC Open Series Fault considerations for Distributed Generation µGrid architecture

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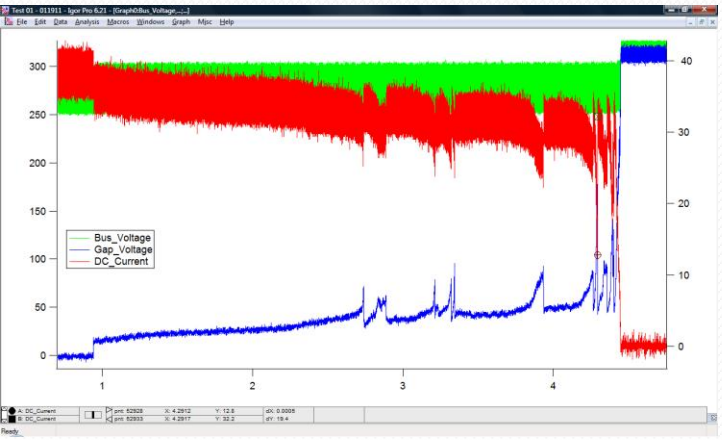
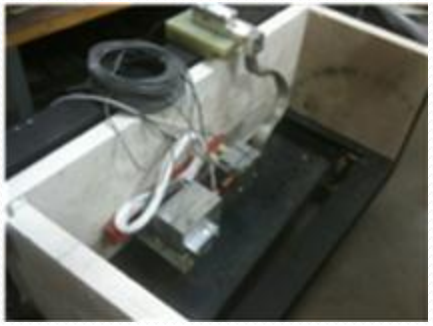
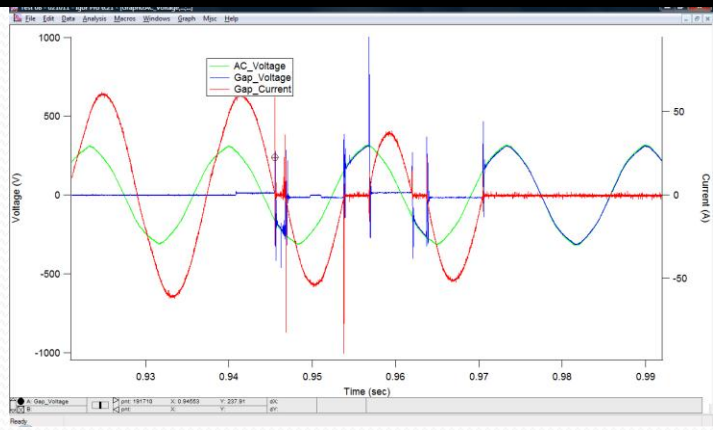
- DC renewable energy generation / storage
  - *solar PV arrays, fuel cells, microturbines, batteries, ultracapacitors, rectified wind systems*
- With localized generation, without the need to transmit long distances, for large electronic loads *(i.e. data centers)* distributed generation from HVDC µGrids is gaining promise.
- Control focus is power electronics & DC-DC converters
- However, one major concern is the **safety** of DC µGrids, particularly during a **fault** condition
- Research topic is therefore on HVDC open series fault formations & effects on localized grid



DC open series fault transients



copper contacts / simulated fault



AC open series fault transients

- Experimental approach by 1st building a µGrid:
  - *3φ AC source panel → variac or transformer → passive 6 diode bridge rectifier (DBR) → "open series fault" → R-L load*
- DC *(280 – 635V)* vs. AC systems of "*quasi-equivalent*" parameters
- monitor AC & DC currents, voltages, arc fault transients, power dissipated, bus disturbances, duration, re-strikes, loading effects
- 50 to 5 µs data capture rates, 12 bit resolution
- modeling, DC breaker designs, DC architecture fault clearing strategies, safety recommendations
- http://www.youtube.com/user/utcem