DFIG/Wind Turbine Modeling and Protection

Design Review #1

Team Power Team

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Team Power Team Design Review

Itinerary:

- 1. Our understanding of project goals
 - a. Parameterize DFIG
 - b. Build RSCAD model
 - i. Implement Mike Beacham's control for DFIG
 - ii. Include micro-grid
 - c. Detect one type of fault
 - d. Protection scheme for transmission system
- 2. Current project standing
 - a. Base transmission system model utilizing canned DAG
 - b. Working runtime model with multiple fault types and locations
 - i. Button operated faults
 - c. Parameterized DFIG
 - d. Project research
 - i. DFIG protection problems
 - ii. 411 and 421
 - iii. RSCAD learning
- 3. Questions for Normann
 - a. Transmission line model length?
 - b. Type of fault?
 - i. SLG is most common but 3ph seems to be easier to work with.
 - c. Are there components that need to be added or taken away from model?
 - d. Can we utilize existing 411, 421, or 311 to look at line current differential?
 - i. Normann's preference?
 - e. What does done look like?
 - i. Specific deliverables
 - ii. Time specifications for detection and protection
 - 1. We are eyeing 2 Oyde detection. Is this a realistic number?
 - iii. Information relevent to project?
 - 1. Insight?
 - 2. SEL Contacts?

DFIG Project Specifications

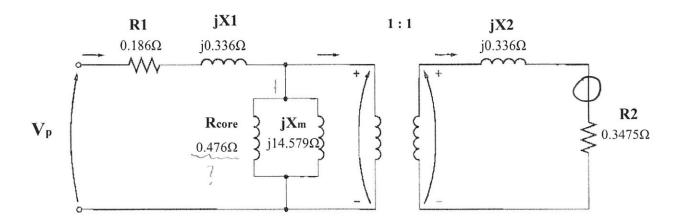
- 1. Customer needs a protection scheme
 - a. Verification of pre-designed model
 - b. Fault analysis on DFIG connected to model power grid
 - c. Use existing technology to detect and protect against a single fault
 - d. Verify protection scheme

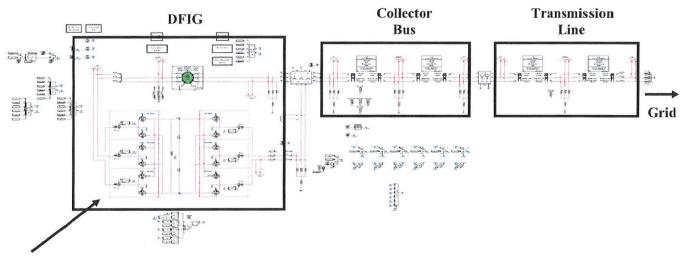
Specific Requirement	Description	Target	Acceptable Performance	
Model Verification waveforms we have for off after 2 cycles of	Receipt of pre-designed wind turbine simulation to be verified by comparison to known results	Model behavior matches that of known examples	Same	Vz cycle
Fault Analysis of DFIG	Analysis of current, voltage, and duration of DFIG under fault conditions	Behavior matches known fault conditions	Same	
Detect a fault	A scheme to detect a single type of fault (TBD) while fault is occurring	Detection within 2 cycles (Preliminary)	Detection within 4 cycles Within 1 cycle - 1	
Equipment protection	Power system protection following detection	Within 4 cycle of detection	Within 10 cycles of detections	
Protection Verification	Compare modeled protection scheme to scheme demonstrated physically on model power system with DFIG	Parameters within a standard deviation	Parameters within two standard deviations	
Existing technology	Use of off the shelf SEL equipment to detect and protect faults	Using equipment already in lab	SEL donations of needed equipment	

- 411 L - Lowest voltage = faulted phase 1> single LG fault

Action	Deadline	
Parameterization of DFIG Machine	October 30, 2014	
Begin modeling model power system in RSCAD	Mid November	
Determine type of fault to be analyzed	December 8, 2014	
Come up with preliminary design for protection scheme	January	
Begin protection simulation testing	February	
Have "black box" representation of protection scheme	May	

Generator Parameters





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