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| Model Name: Example Listing | | |
| Name and affiliation of author or POC:  Chris Smith, MIT Lincoln Laboratory | Model Symbol: | Accreditation (TRL?):  5 |
| Date of Publication:  7/8/2017 |
| Version Information:  1.0 |
| Model accessibility (open source, license, …):  Open source |
| Model Description and Theory of Operation:  Energy storage tied to the grid as three-phase AC. The device operates in grid forming and following depending on the status of the cmds.GridBreaker input.  List of References:   * J. Kim, J. M. Guerrero, P. Rodriguez, R. Teodorescu and K. Nam, "Mode Adaptive Droop Control With Virtual Output Impedances for an Inverter-Based Flexible AC Microgrid," in IEEE Transactions on Power Electronics, vol. 26, no. 3, pp. 689-701, March 2011. | | |
| Model Specifications:  The system is modeled as three controlled current sources with a PLL and droop feedback for voltage and frequency. Current and voltage limits as well as appropriate faults have been modeled.  Assumptions and Limitations   * Nominal frequency is assumed to be 60Hz | | |
| Interfacing Information (platform, input requirements, possible outputs):   1. Inputs:   Cmds (bus):  Enable- Set to 1 for operation of ESS  ModbusEnable- Set to 1 for operation of ESS  PCmd- real power command (kW)  QCmd- reactive power command (kVar)  VoltCmd- voltage command (PU offset to 1)  FreqCmd- frequency command (PU, offset to 0)  GridBreaker- Grid breaker state. When 1 the ESS is in grid following mode.   1. Outputs:   Meas (bus):  Inverter.Vabc\_meas- measured inverter ABC voltage (Volts)  Inverter.Vdq0\_meas- measured inverter DQ0 frame voltage (Volts)  Inverter.Iabc\_meas- measured inverter ABC current (Amps)  Inverter.Idq\_meas- measured inverter DQ0 current  Inverter.Freq- measured grid frequency  Inverter.Idq\_cmd- commanded DQ current  Inverter.kw- real power  Inverter.kvar- reactive power  Inverter.faults.ISat- current being limited due to a high current  Inverter.faults.IVlimited- current sources are voltage limited  Inverter.faults.PLL- PLL is not tracking the voltage accurately  Inverter.faults.Vrms- grid voltage is out of range for proper operation  Inverter.faults.DCOvervoltage- battery voltage is too high  Battery.SoC- battery state of charge (0-100%)  Battery.BattFull- battery cannot store any more energy  Battery.BattEmpty- battery has no energy remaining   1. Electrical connections:   A, B, C phase connections are the power connection to the grid.   1. Parameters:   Parameters are configured in the Software\_BESS\_init.m script. | | |
| Diagrammatic Representation of Model Internals: | | |
| Model Validation (technique used, evidence):  The model is not validated against actual hardware. See reference above. | | |
| Simulation Platform, Solvers:  Matlab 2013a with Simscape. A discrete Tustin solver with 100us time step was used. | | |
| Known Issues:  Stability with all grid impedances is unproven. | | |
| Models which use this block:  None | | |