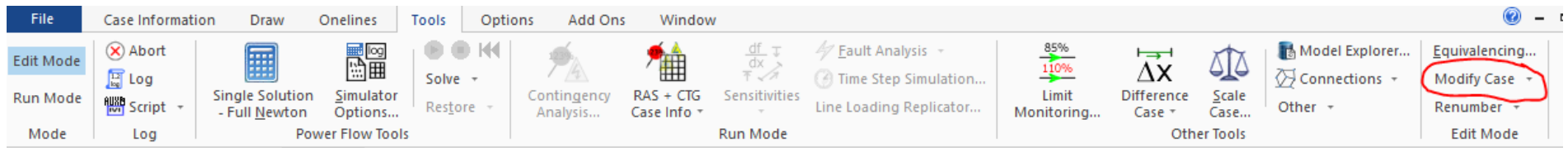


Application of Composite Load Models in the Power Flow

PowerWorld Client Conference

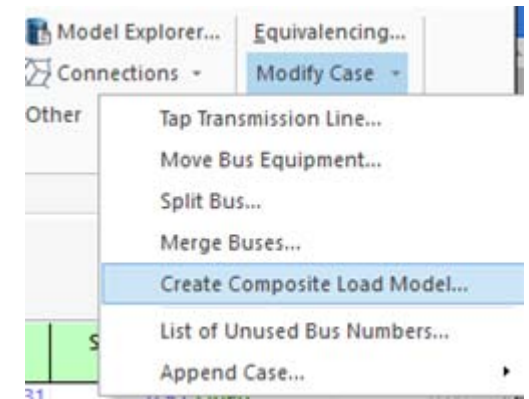
June 19, 2018

Gordon Comegys
gcomegys@ieee.org



Outline

- Description of feature
- Potential applications
- Example of past study result
- Instructions for a study
- Appendix - text for aux files
- Interactive Demonstation



Description of Feature

Background – development events in 2011-12

- Composite load model for transient stability studies implemented in WECC cases
- PowerWorld includes model using static parameters from the dynamic data records
- Time Step Simulation tool enhanced to model
 - capacitor switching cut-in/cut-out voltage settings and time delays
 - transformer tap change time delays for first and subsequent tap changes
- Motor parameters for static constant impedance, constant current, and constant power calculated for power flow application

Feature

- Replaces the load objects with a distribution equivalent
- Includes
 - step down transformer
 - Voltage regulator
 - Distribution line
 - End use motor loads, electronic load, and ZIP static loads
- Excellent Simulator Help description (search for keyword “composite”)

Composite Load Model Potential Applications

- Without Time Step Simulation
 - Test failed solutions in contingency analysis with composite load model
 - If successful solution, the condition likely represents load area voltage stability limit exceeded condition developing over several minutes
 - System condition stable for the first 30 seconds
- With Time Step Simulation tool
 - Fast simulation of voltage instability scenario over timeframe of 5-20 minutes
 - Determine mitigating cut-in/cut-out voltage and time delay capacitor relay settings
 - Through trial and error, find threshold settings to reverse uncontrolled voltage decline
 - Settings to prevent hunting
 - Settings to minimize overvoltage effects at end user loads after system restoration
 - Determine effective undervoltage load shedding locations and settings
 - Fast multiple simulations to explore assumption sensitivities

Example of Past Study

columbiagrid.org/CCST-documents.cfm



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PROGRAMS

Planning and Expansion

Mission and Vision

Other Services



All Programs > Planning and Expansion > Biennial Transmission B Team

Study Team: Cross Cascades Study Team

[Overview](#) | [Details](#) | [Staff](#) | [Calendar](#) | [Documents](#)

Cross Cascades Study Team Documents

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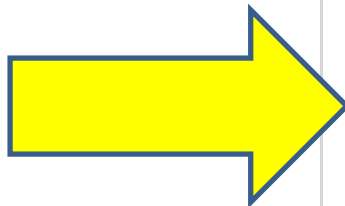
12/06/2012 Cross Cascades North Study Report Appendix B Update (v: 06Dec12)

..._AppendixB_Update_05Dec12.pptx [download>](#)

Type:

Status: DRAFT

[Contact](#)



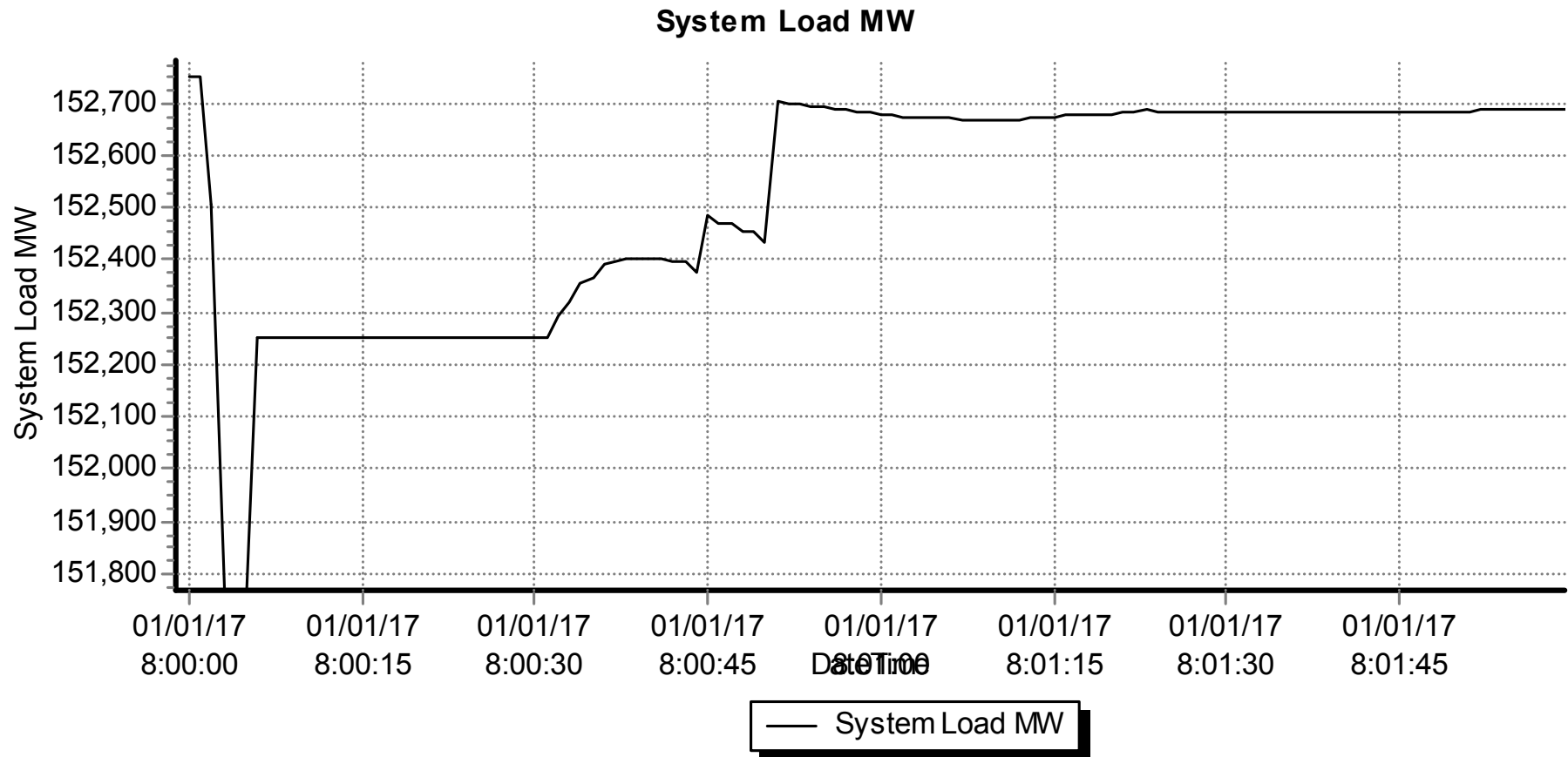
Excerpt from ColumbiaGrid Past Study Documentation

40869 (RAVER) PU Volt



Excerpt from ColumbiaGrid Past Study

- The system load restores close to the original after about a minute
- This is an indication the conditions do not exceed the voltage stability limit at that time point
- Notice before that time how the load begins to successfully restore, but then declines
- These are intermediate conditions that exceed the voltage stability limit, until capacitors switch in and bring it out of the condition



Preview of some setting changes unique to this application

Common Options | **Advanced Options** | Island-Based AGC | DC Options | General | Storage

Dynamically add/remove slack buses as topology is changed
 Evaluate Power Flow Solution For Each Island

Define Post Power Flow Solution Actions

Power Flow (Inner) Loop Options

Disable Power Flow Optimal Multiplier
 Initialize from Flat Start Values

Minimum Per Unit Voltage for

Constant Power Loads: 0.700
Constant Current Loads: 0.500

Control (Middle) Loop Options

Disable Treating Continuous SSs as PV Buses
 Disable Balancing of Parallel LTC Taps
 Model Phase Shifters as Discrete Controls
 Disable Transformer Tap Control if Tap Sens. is the Wrong Sign (Normally Check This)



Power Flow Solution

Common Options | **Advanced Options** | Island-Based AGC | DC Options | General | Storage

Dynamically add/remove slack buses as topology is changed
 Evaluate Power Flow Solution For Each Island

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Disable Treating Continuous SSs as PV Buses
 Disable Balancing of Parallel LTC Taps
 Model Phase Shifters as Discrete Controls
 Disable Transformer Tap Control if Tap Sens. is the Wrong Sign (Normally Check This)

Display/Column Options

Column Options | **Display Options** | Data View Layouts

Available Fields

- Derived Status
- ID
- Name of Bus
- Name_Nominal kV of Bus
- Number of Bus
- Object ID (for use in AUX or Paste)
- Online
- Status
- Amps
- Area
- Balancing Authority
- Benefit
- Calculated Field
- Custom
- Data Check
- Data Maintainer
- Difference Case
- Dist Gen
- EPC File
- Fault Analysis
- Geography
- Island
- Labels
- MVA
- Mvar
 - Mvar
 - Mvar I (Constant Current)
 - Mvar S (Constant Power)
 - Mvar Z (Constant Impedance)
 - Scale Mvar with Injection Group
- MW
 - AGC
 - Interruptible
 - MW
 - MW (maximum)
 - MW (minimum)
 - MW I (Constant Current)
 - MW S (Constant Power)
 - MW Z (Constant Impedance)
- OPF

Switched Shunts and Transformer fields unique to this application

Switched Shunts (filtered) X Buses

Filter Advanced Switched Shunt Find... R

Display/Column Options

Column Options Display Options Data View Layouts

Available Fields Find Field...

- Substation
- Super Area
- SVC Control
- Time Step
 - First Move Delay Above
 - First Move Delay Below
 - Max Steps to Move
 - Model Switching Delay
 - Next Move Delay Above
 - Next Move Delay Below
 - Sec. First Move Delay Above
 - Sec. First Move Delay Below
 - Sec. Max Steps to Move
 - Sec. Next Move Delay Above
 - Sec. Next Move Delay Below
 - Secondary Regulation Maximum
 - Secondary Regulation Minimum
 - Time Selected
 - Use Secondary Regulation Range
- Topology

Show these fields

- Number of Bus
- Name of Bus
- ID
- Regulated Bus
- Status
- Status Branch
- Control Mode
- Control Regula
- Mvar Mvar (act
- Regulated Bus
- Regulated Bus
- Regulated Bus
- Mvar Mvar (not
- Mvar Mvar (ma
- Mvar Mvar (mir

Highlight Key Fields Required Fields

Show Column Col Width

Transformer Controls (filtered) X Switched Shunts X Buses

Filter Advanced Branch Find... R

Display/Column Options

Column Options Display Options Data View Layouts

Available Fields Find Field...

- Time Step
- Topology
- Transformer
 - Time Step Simulation
 - First Move Delay Above
 - First Move Delay Below
 - Max Steps to Move
 - Model Tap Delay
 - Next Move Delay Above
 - Next Move Delay Below
 - Sec. First Move Delay Above
 - Sec. First Move Delay Below
 - Sec. Max Steps to Move
 - Sec. Next Move Delay Above
 - Sec. Next Move Delay Below
 - Secondary Regulation Maximum
 - Secondary Regulation Minimum
 - Use Secondary Regulation Range
 - Auto Control Enabled
 - Configuration


Show these fields

- Number at Fr
- Name at Fron
- Name at To
- Circuit
- Transformer\
- Status
- Transformer\
- Transformer\
- Transformer\
- Transformer\
- Transformer\
- Transformer\
- Transformer\

Highlight Key Fields Required Fields

Show Col Col Width 65

← → ↻ 🏠 🔒 https://svn.pnl.gov/LoadTool 📄 133%



Load model data tool

The tool generates load composition model in PSLF (.dyd) and PSSE (.dyr) formats.

Version history

Version 1.0
Supports PSLF18 and PSSE dynamic records

Version 1.1
Support of PSLF19 Long ID is added
[📄 Download LMDT version 1.1](#)

Version 2.0

1. New analytical functions
2. New advanced user interface

Version 2.1

3. Multiple presets can be stored in the configuration file
4. Support PSSE CMLDBLU2 model

Version 2.2
(last update 2/27/2018)

5. Support PSLF CMLPDWG: PVD1 and DER_A (needs more testing)

[📄 Download LMDT version 2.2](#)

[📄 LMDT 2.0 PowerPoint presentation \(with step by step instruction\)](#)

PNNL tool creates composite load model records, or use WECC case dyd file

Instructions For “Create Composite Load Model”

1. Optional for validation – fill bus custom float fields with base case load MW and MVAR quantities (File 1 in appendix)
2. Load WECC case dyd file, or create the composite load dyd records with PNNL Load Modeling Tool
3. In edit mode, click on Tools>Modify Case>Create Composite Load Model
4. Solve
5. Change motor loads to constant impedance, constant current, and constant power (File 2 in the appendix).
6. Solve

Instructions For Time Step Simulation Case Setup (aux file for steps 1-4 is File 3 in appendix)

1. Create a “No Contingency” contingency (use specific solution options, set to same as PowerFlow, set to zero the “min pu voltage for constant power load” and min pu voltage for constant current load”), set LDC_RCC to “PostCTG” and solve this selected contingency.
2. In Simulator Options>Power Flow Solution>Advanced Options, uncheck the “Disable Transformer Tap Control if Tap Sens. is the Wrong Sign”
3. In Transformer Controls case info display:
 - a. Display Transformer>Time Step Simulation>Model Tap Delay
 - b. toggle all “XF auto” to “No”
 - c. filter case info “From Name” for string contains “Low Side” and toggle “XF auto” to “Yes” and Model Tap Delay to “Yes” for these transformers.
 - d. optional: change default 15 seconds to 2 seconds for Transformer>Time Step Simulation>Next Move Delay Below and Next Move Delay Above
 - e. Solve
4. Open Time Step Simulation (TSS) tool
5. Insert TSS time points for 1 second increments and set quantities to be monitored (instructions in Simulator help).
6. Insert TSS script command to simulate contingency
7. Run the Time Step Simulation and plot selected quantities

Sensitive Composite Load Model Assumptions to Investigate

- Distribution voltage regulator tap delays
 - Default is 30 seconds for the first delay (common) and 15 seconds for subsequent delays (varies widely).
 - Investigate actual field settings, or model worst case 2 second tap change delay after initial 30 second delay
 - Some long distribution lines have two voltage regulators, effectively giving twice the range (40% instead of 20%). Test sensitivity by increasing the range.
 - Base case starting tap might optimistically limit remaining boost range. Can be test by increasing the tap range.
- Load composition
 - The model parameters rely on data submitters correct climate zone and feeder type (PSLF load longID).
 - Confirm accuracy
 - If detailed composition is known, the PNNL LMDT provides user customization

Appendix - Text for aux files (copy and paste from these slides)

File 1- Optional for validating composite load model matches original bus load before conversion. To be applied before creating the composite load model

```
DATA (Filter, [ObjectType,FilterName,FilterLogic,FilterPre,Enabled],,yes)
{
"Branch" "CMPLDW TX Low Side" "AND" "NO" "YES"
<SUBDATA Condition>
  BusName contains "Low Side"
</SUBDATA>
}
DATA (CustomFieldDescription, [ObjectType,CustomType,CustomMaxOfType,CustomFieldCaption,CustomHeaderCaption],,Yes)
{
"Bus" "Floating Point" 2 "OriginalLoadMW,OriginalLoadMVR" "OriginalLoadMW,OriginalLoadMVR"
}
SCRIPT
{
SetDATA(Bus,[CustomFloat:OriginalLoadMW,CustomFloat:OriginalLoadMVR],[@"BusLoadMW",@"BusLoadMVR"],All);
}
DATA (BGCalculatedField, [WhoAml,ObjectType,VariableName,BGCalcFieldOperation,BGCalcFieldUseAbsolute,
  BGCalcFieldBlankEntries,FilterName,ObjectType:1,FilterLogic,FilterPre,Enabled],,Yes)
{
"CMPLDW_Tx_MW" "Branch" "LineMW:1" "Sum" "NO" "As Zeros" "YES" "Branch" "AND" "NO" "YES"
<SUBDATA Condition>
  _UseAnotherFilter meets "CMPLDW TX Low Side"
</SUBDATA>
"CMPLDW_Tx_MVR" "Branch" "LineMVR:1" "Sum" "NO" "As Zeros" "YES" "Branch" "AND" "NO" "YES"
<SUBDATA Condition>
  _UseAnotherFilter meets "CMPLDW TX Low Side"
</SUBDATA>
}
DATA (DataGrid, [DataGridName,BGDisplayFilter,CaseInfoRowHeight,NonDefaultFont,FontName,
  FontStyles,SOfontSize,FontColor,VariableName,ConditionType,FilterName,
  ViewZoomLevel,FrozenColumns,RemoveTrailingZeros])
{
"Bus" "YES" 13 "NO" "Segoe UI" "" 8 0 "" "High To Low" "" 100.000 -1 "NO"
<SUBDATA ColumnInfo>
  "BusNum" 75 8 2
  "BusName" 75 8 2
  "AreaName" 75 8 2
  "BusNomVolt" 75 8 2
  "CustomFloat" 75 8 2
  "CalcField" 75 8 2
  "CustomFloat:1" 75 8 2
  "CalcField:1" 75 8 2
</SUBDATA>
}
```

File 2 (4 slides) – modify the constant MVA motor loads to ZIP parameters based on the paper “Application of the WECC Composite Load Model for use in Powerflow Studies” by James Randall (IEEE PES General Meeting July 2013)

```
DATA (CustomFieldDescription, [ObjectType,CustomType,CustomMaxOfType,CustomFieldCaption,CustomHeaderCaption],,Yes)
{
"Load" "Floating Point" 2 "OriginalSMW,OriginalSMVR" "OriginalSMW,OriginalSMVR"
"Load" "String" 1 "MotorSubType" "MotorSubType"
}
SCRIPT
{
UnselectAll(Filter);
UnselectAll(CustomExpression);
}
DATA (Filter, [ObjectType,FilterName,FilterLogic,FilterPre,Enabled,Selected],,yes)
{
"LoadCharacteristic_MOTOR_CMP" "A1" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
Lfm about 0.75 0.00001
TSRa about 0.04 0.00001
TSLs about 1.8 0.00001
TSLp about 0.12 0.00001
TSLpp about 0.104 0.00001
TSTpo about 0.095 0.00001
TSTppo about 0.0021 0.00001
TSD about 0 0.00001
</SUBDATA>
"LoadCharacteristic_MOTOR_CMP" "A2" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
Lfm about 0.85 0.00001
TSRa about 0.01 0.00001
TSLs about 3.1 0.00001
TSLp about 0.20 0.00001
TSLpp about 0.165 0.00001
TSTpo about 0.80 0.00001
TSTppo about 0.0026 0.00001
TSD about 0 0.001
</SUBDATA>
"LoadCharacteristic_MOTOR_CMP" "B0" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
Lfm about 0.75 0.00001
TSRa about 0.03 0.00001
TSLs about 1.8 0.00001
TSLp about 0.19 0.00001
TSLpp about 0.140 0.00001
TSTpo about 0.200 0.00001
TSTppo about 0.0026 0.00001
TSH about 0.50 0.00001
TSD about 2 0.001
</SUBDATA>
```

File 2 continued (page 2)

```
"LoadCharacteristic_MOTOR_CMP" "B1" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  Lfm about 0.85 0.00001
  TSRa about 0.01 0.00001
  TSLs about 3.1 0.00001
  TSLp about 0.20 0.00001
  TSLpp about 0.165 0.00001
  TSTpo about 0.800 0.00001
  TSTppo about 0.0026 0.00001
  TSH about 1.00 0.00001
  TSD about 2 0.001
</SUBDATA>
"LoadCharacteristic_MOTOR_CMP" "C0" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  Lfm about 0.75 0.00001
  TSRa about 0.03 0.00001
  TSLs about 1.8 0.00001
  TSLp about 0.19 0.00001
  TSLpp about 0.140 0.00001
  TSTpo about 0.200 0.00001
  TSTppo about 0.0026 0.00001
  TSH about 0.15 0.00001
  TSD about 2 0.001
</SUBDATA>
"LoadCharacteristic_MOTOR_CMP" "C1" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  Lfm about 0.85 0.00001
  TSRa about 0.01 0.00001
  TSLs about 3.1 0.00001
  TSLp about 0.20 0.00001
  TSLpp about 0.165 0.00001
  TSTpo about 0.800 0.00001
  TSTppo about 0.0026 0.00001
  TSH about 0.2 0.00001
  TSD about 2 0.001
</SUBDATA>
"Load" "A1" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  CustomString = "A1"
</SUBDATA>
"Load" "A2" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  CustomString = "A2"
</SUBDATA>
"Load" "B0" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  CustomString = "B0"
</SUBDATA>
```


File 2 continued (page 3)

```
"Load" "B1" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  CustomString = "B1"
</SUBDATA>
"Load" "C0" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  CustomString = "C0"
</SUBDATA>
"Load" "C1" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  CustomString = "C1"
</SUBDATA>
"Load" "1phaseACmotor" "AND" "NO" "YES" "YES"
<SUBDATA Condition>
  LoadID = "MD"
  BusName contains "Load Bus"
</SUBDATA>
}
SCRIPT
{
DeleteFile("CMPLDW_Motor_Subtype.csv");
WriteTextToFile("CMPLDW_Motor_Subtype.csv","Load");
WriteTextToFile("CMPLDW_Motor_Subtype.csv","CustomString,BusNum,LoadID");
SaveDataWithExtra("CMPLDW_Motor_Subtype.csv",CSVNOHEADER,LoadCharacteristic_MOTOR_CMP,[BusNum,LoadID],[],"A1",[],["CustomString"],["A1"]);
SaveDataWithExtra("CMPLDW_Motor_Subtype.csv",CSVNOHEADER,LoadCharacteristic_MOTOR_CMP,[BusNum,LoadID],[],"A2",[],["CustomString"],["A2"]);
SaveDataWithExtra("CMPLDW_Motor_Subtype.csv",CSVNOHEADER,LoadCharacteristic_MOTOR_CMP,[BusNum,LoadID],[],"B0",[],["CustomString"],["B0"]);
SaveDataWithExtra("CMPLDW_Motor_Subtype.csv",CSVNOHEADER,LoadCharacteristic_MOTOR_CMP,[BusNum,LoadID],[],"B1",[],["CustomString"],["B1"]);
SaveDataWithExtra("CMPLDW_Motor_Subtype.csv",CSVNOHEADER,LoadCharacteristic_MOTOR_CMP,[BusNum,LoadID],[],"C0",[],["CustomString"],["C0"]);
SaveDataWithExtra("CMPLDW_Motor_Subtype.csv",CSVNOHEADER,LoadCharacteristic_MOTOR_CMP,[BusNum,LoadID],[],"C1",[],["CustomString"],["C1"]);
SetData(Load,[CustomFloat:OriginalSMW,CustomFloat:OriginalSMVR],["@LoadSMW","@LoadSMVR"],All);
LoadCSV("CMPLDW_Motor_Subtype.csv");
}
DATA (CustomExpression, [ObjectType,ObjectType:1,CustomExpressionString,VariableName,VarBlankIsZero,
  EvaluateInRef,VariableName:1,VarBlankIsZero:1,EvaluateInRef:1,Selected],,Yes)
{
"Load:1" "A1_MW_Z" "0.24606*x1/x2^2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:2" "A1_MW_I" "-0.52725*x1/x2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:3" "A1_MW_S" "1.28119*x1" "CustomFloat:OriginalSMW" "YES" "NO" "" "" "" "Yes"
"Load:4" "A2_MW_Z" "0.07673*x1/x2^2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:5" "A2_MW_I" "-0.17484*x1/x2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:6" "A2_MW_S" "1.09811*x1" "CustomFloat:OriginalSMW" "YES" "NO" "" "" "" "Yes"
"Load:7" "B0_MW_Z" "-0.1149*x1/x2^2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:8" "B0_MW_I" "0.28307*x1/x2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:9" "B0_MW_S" "0.83183*x1" "CustomFloat:OriginalSMW" "YES" "NO" "" "" "" "Yes"
"Load:10" "B1_MW_Z" "-0.0947*x1/x2^2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:11" "B1_MW_I" "0.21097*x1/x2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:12" "B1_MW_S" "0.88373*x1" "CustomFloat:OriginalSMW" "YES" "NO" "" "" "" "Yes"
"Load:13" "C0_MW_Z" "-0.10186*x1/x2^2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
"Load:14" "C0_MW_I" "0.2549*x1/x2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
```

File 2 continued (page 4)

```
Load:15" "C0_MW_S" "0.84696*x1" "CustomFloat:OriginalSMW" "YES" "NO" "" "" "" "Yes"
Load:16" "C1_MW_Z" "-0.08025*x1/x2^2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:17" "C1_MW_I" "0.18034*x1/x2" "CustomFloat:OriginalSMW" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:18" "C1_MW_S" "0.89991*x1" "CustomFloat:OriginalSMW" "YES" "NO" "" "" "" "Yes"
Load:19" "A1_MVR_Z" "1.75272*x1/x2^2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:20" "A1_MVR_I" "-1.86768*x1/x2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:21" "A1_MVR_S" "1.11496*x1" "CustomFloat:OriginalSMVR" "YES" "NO" "" "" "" "Yes"
Load:22" "A2_MVR_Z" "3.5462*x1/x2^2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:23" "A2_MVR_I" "-6.39174*x1/x2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:24" "A2_MVR_S" "3.84554*x1" "CustomFloat:OriginalSMVR" "YES" "NO" "" "" "" "Yes"
Load:25" "B0_MVR_Z" "1.87233*x1/x2^2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:26" "B0_MVR_I" "-2.3714*x1/x2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:27" "B0_MVR_S" "1.49907*x1" "CustomFloat:OriginalSMVR" "YES" "NO" "" "" "" "Yes"
Load:28" "B1_MVR_Z" "3.00723*x1/x2^2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:29" "B1_MVR_I" "-5.29939*x1/x2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:30" "B1_MVR_S" "3.29216*x1" "CustomFloat:OriginalSMVR" "YES" "NO" "" "" "" "Yes"
Load:31" "C0_MVR_Z" "1.88558*x1/x2^2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:32" "C0_MVR_I" "-2.39865*x1/x2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:33" "C0_MVR_S" "1.51307*x1" "CustomFloat:OriginalSMVR" "YES" "NO" "" "" "" "Yes"
Load:34" "C1_MVR_Z" "3.04242*x1/x2^2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:35" "C1_MVR_I" "-5.36992*x1/x2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:36" "C1_MVR_S" "3.3275*x1" "CustomFloat:OriginalSMVR" "YES" "NO" "" "" "" "Yes"
Load:37" "D_MVR_Z" "26.25874*x1/x2^2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:38" "D_MVR_I" "-44.51456*x1/x2" "CustomFloat:OriginalSMVR" "YES" "NO" "BusPUVolt" "YES" "NO" "Yes"
Load:39" "D_MVR_S" "19.25582*x1" "CustomFloat:OriginalSMVR" "YES" "NO" "" "" "" "Yes"
}
SCRIPT
{
SetDATA(Load,[LoadZMW,LoadIMW,LoadSMW,LoadZMVR,LoadIMVR,LoadSMVR],["@CustomExpression:A1_MW_Z", "@CustomExpression:A1_MW_I", "@CustomExpression:A1_MW_S", "@CustomExpression:A1_MVR_Z", "@CustomExpression:A1_MVR_I", "@CustomExpression:A1_MVR_S"], "A1");
SetDATA(Load,[LoadZMW,LoadIMW,LoadSMW,LoadZMVR,LoadIMVR,LoadSMVR],["@CustomExpression:A2_MW_Z", "@CustomExpression:A2_MW_I", "@CustomExpression:A2_MW_S", "@CustomExpression:A2_MVR_Z", "@CustomExpression:A2_MVR_I", "@CustomExpression:A2_MVR_S"], "A2");
SetDATA(Load,[LoadZMW,LoadIMW,LoadSMW,LoadZMVR,LoadIMVR,LoadSMVR],["@CustomExpression:B0_MW_Z", "@CustomExpression:B0_MW_I", "@CustomExpression:B0_MW_S", "@CustomExpression:B0_MVR_Z", "@CustomExpression:B0_MVR_I", "@CustomExpression:B0_MVR_S"], "B0");
SetDATA(Load,[LoadZMW,LoadIMW,LoadSMW,LoadZMVR,LoadIMVR,LoadSMVR],["@CustomExpression:B1_MW_Z", "@CustomExpression:B1_MW_I", "@CustomExpression:B1_MW_S", "@CustomExpression:B1_MVR_Z", "@CustomExpression:B1_MVR_I", "@CustomExpression:B1_MVR_S"], "B1");
SetDATA(Load,[LoadZMW,LoadIMW,LoadSMW,LoadZMVR,LoadIMVR,LoadSMVR],["@CustomExpression:C0_MW_Z", "@CustomExpression:C0_MW_I", "@CustomExpression:C0_MW_S", "@CustomExpression:C0_MVR_Z", "@CustomExpression:C0_MVR_I", "@CustomExpression:C0_MVR_S"], "C0");
SetDATA(Load,[LoadZMW,LoadIMW,LoadSMW,LoadZMVR,LoadIMVR,LoadSMVR],["@CustomExpression:C1_MW_Z", "@CustomExpression:C1_MW_I", "@CustomExpression:C1_MW_S", "@CustomExpression:C1_MVR_Z", "@CustomExpression:C1_MVR_I", "@CustomExpression:C1_MVR_S"], "C1");
SetDATA(Load,[LoadZMVR,LoadIMVR,LoadSMVR],["@CustomExpression:D_MVR_Z", "@CustomExpression:D_MVR_I", "@CustomExpression:D_MVR_S"], "1phaseACmotor");
Delete(Filter,Selected);
Delete(CustomExpression,Selected);
DeleteFile("CMPLDW_Motor_Subtype.csv");
}
```

File 3 – optional file useful for preparing the case for to apply the Time Simulation Tool with the composite load model (doesn't include preparing settings for specific capacitor switching)

```
DATA (Filter, [ObjectType,FilterName,FilterLogic,FilterPre,Enabled],,Yes)
{
"Branch" "CMPLDW Low Side" "AND" "NO" "YES"
<SUBDATA Condition>
  BusName contains "Low Side" 1
</SUBDATA>
}
DATA (Contingency, [CTGLabel,Include,CTGIgnoreSolutionOptions],,Yes)
{
"NoContingency-Set-LDC-RCC" "NO" "YES"
}
SCRIPT
{
SetDATA (Gen, [GenUseLDCRCC],["PostCTG"],All);
SetDATA (Shunt,[AutoControl],["No"],All);
SetDATA(Sim_Solution_Options,[SEODisableXFTapControlIfSensWrongSign,MinVoltLoad,MinVoltSLoad],["NO",0,0]);
SetData(Branch, [XFAuto],["No"],All);
CTGSolve("NoContingency-Set-LDC-RCC");
SetDATA (Branch,[XFAuto,MoveDelay:2,MoveDelay:3],["Yes",2,2],"CMPLDW Low Side");
}
```