Composite Load Model Data Builder

(For the CMPLDW model used in the GE PSLF program)

User Manual

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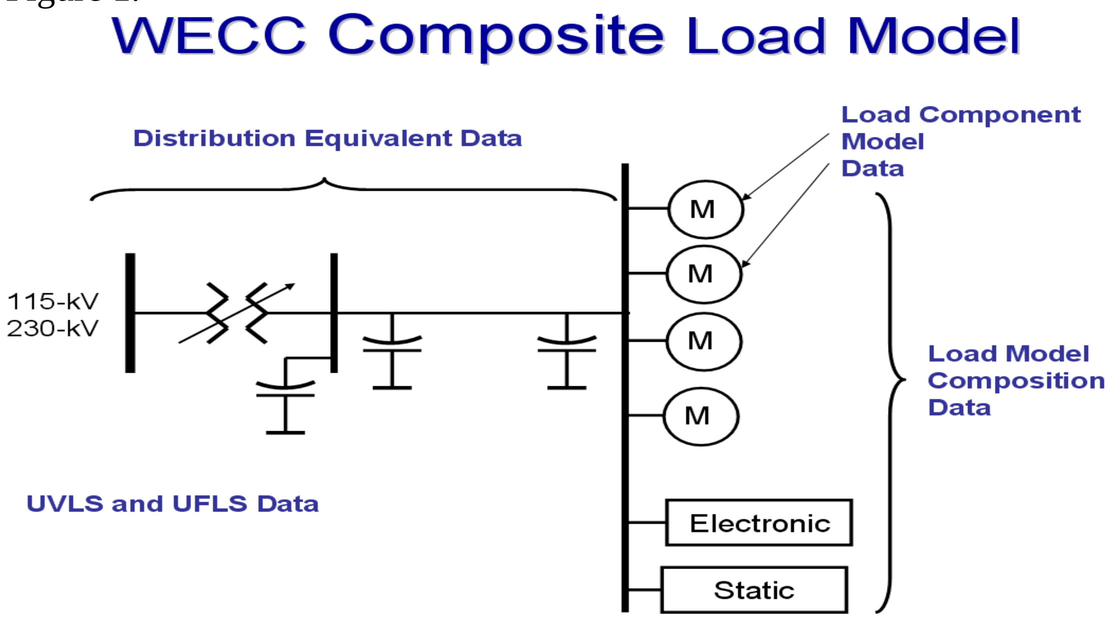
1. Background

This CMPLDW Data Builder is a simplified version of the PG&E Load Modeling Tool (LMT), developed in 2003. The LMT was used for the PSLF power flow and dynamic data expansion, reflecting load transfer from the transmission buses to the equivalent end-user buses and for end-user load breakdown to aggregated motor and non-motor components in accordance with the bus load composition[1]. The used in LMT equivalent distribution system structure (Figure 1) and methods of defining distribution component parameters were recommended later by the WECC M&VWG as a basis for further composite load model developments.

Figure 1.



The simplifications are justified by studies and developments, implemented by PG&E, BPA, PNNL and GE. The simplifications count the following:

- It was shown that entire end-user load can be transferred from a transmission bus to the feeder end because reasonable load split between feeder sending and receiving ends do not provide appreciable difference in system performance.
- Representing load composition as a mixture of several typical motor and static components does not affect accuracy in comparison with electro-mechanical aggregation of arbitrary components. This makes possible use of the "rules of association" instead of electro-mechanical aggregation, and rid of the EPRI/GE LOADSIN program, imbedded in the LMT.

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[1] A. Meklin, D. Sutphin. "Dynamic Simulations with Improved Representation of Loads and their Connection to a Power System." AUPEC, September 2005, http://www.itee.uq.edu.au/~aupec/aupec05/AUPEC2005/Volume2/S151.pdf.

- Significant simplification is related to the completion of the GE PSLF CMPLDW model, which mimics a large part of the old tool actions in part of 3-phase motors and ZIP component and complements these actions for single-phase motors and electronic load. CMPLDW also provides more accurate modeling of the underfrequency and undervoltage loadshedding actions.

With these simplifications, the new tool could be considered as a CMPLDW Data Builder and its functions are limited by:
- populating the user-defined CMPLDW table with the input parameters for each load,
- creating records for the CMPLDW models in dynamic data (dyd) files,
- running power flow simulations for the expanded system scheme to be sure that distribution system conditions are appropriate.

2. Program setup

1). Install a version of GE PSLF, containing provisions for the CMPLDW model (released in March 2009 or later).

2). Create a working directory and copy the starting power flow case and dynamic model data into it. All the results will be stored in this directory.

3). Create *'CMPLDW '* subdirectory for the EPCL programs and place there the latest versions of the following EPCL programs:
– *CMPdataBuilder.p*
– *shareLMData.p*
– *cmpsn_by_bus.p*

Make changes in the *javaini.p* file to set the selected working directory and the EPCL subdirectory. Set *dispar[0].ncolpg* = 500.

4). Create *UEPSLF* and *PSLFEXR* subdirectories in the PSLF installation directory (e.g. in *UPSLF17*). Place table configuration files *CMPLDW*, *CMPSN* and *PFLOW* into *UEPSLF* and files *CMPLDW.exr*, *CMPSN.exr* and *PFLOW.exr* into *PSLFEXR*. After this placement, opening or saving of any **.sav* file will be followed by a request to specify a linked **.exs* file. The *.exs files are needed when building CMPLDW models. To disable requests for *.exs files during other studies, rename the *UEPSLF* and *PSLFEXR* subdirectories (e.g. to *+UEPSLF* and *+PSLFEXR).*

3. CMPLDW Data Builder Input and Output Data

There are no special requirements for data preparation in the regular power flow PSLF tables.

The initial data for CMPLDW, the produced CMPLDW parameters and the power flow data for the expanded cases are located in the following files:

- file *case.exs* with three PSLF user-define tables (*CMPLDW, CMPSN and PFLOW*). Their structures are described by the mentioned in Section 2 table configuration files,

- power flow cases, expanded by adding transformers (*case-xfmr.sav*) and by adding transformers and feeders (*case-fder.sav*),
- CMPLDW dyd records for the specified system segment in the *case-segm.dyd* file.

When any of the developed EPCL programs retrieves a *case.sav* power flow case, PSLF automatically generates a *case.exs* extension file with the user-defined tables (initially with many blank columns), linked to this case. To review the *case.exs* tables, use the *uedt* command and click CMPLDW or CMPSN or PFLOW buttons in the pop-up menu.

All three tables are organized similarly to the *load* table and some columns (see the first twelve columns on Figure 2 for the CMPLDW table) are identical to those in the *load* table. The following 41 columns in the CMPLDW table are the input parameters for the CMPLDW dynamic models (see the CMPLDW description in the PSLF manual and Table 1 in this manual), and the remaining parameters (starting from *bss100*) are used for calculations of some CMPLDW parameters.

Figure 2. CMPLDW table in the *CASE.exs* file

BUS-NO	NAME	KV	ID	ST	PLOAD	QLOAD	AREA	ZONE	OWN	V-PU	DEG	MVAbLL	Bss	Rfdr	Xfdr	Fb	Xxf	TfxH	TfxL	LTC	TAPmn	TAPmx	step	Vmin	Vmax	Tdel1	Tdel2
37117	POCKET 2	69.00	1	1	186.79	34.78	30	322	363	1.04	-18.8	186.8	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37121	ELKGROV2	69.00	1	1	184.80	34.78	30	322	363	1.03	-20.5	184.8	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37106	HEDGE 1	69.00	1	1	183.81	34.78	30	322	363	1.02	-22.1	183.8	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37123	NATOMAS	69.00	1	1	179.84	33.78	30	322	363	1.03	-19.9	179.8	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37109	HURLEY 2	69.00	1	1	179.84	33.78	30	322	363	1.03	-22.6	179.8	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37108	HURLEY 1	69.00	1	1	178.84	33.78	30	322	363	1.03	-20.3	178.8	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37114	ORANGVL1	69.00	1	1	177.85	32.79	30	322	363	1.03	-21.9	177.8	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37101	CARMICAL	69.00	1	1	175.86	32.79	30	322	363	1.03	-22.3	175.9	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37116	POCKET 1	69.00	1	1	172.88	32.79	30	322	363	1.04	-21.9	172.9	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37107	HEDGE 3	69.00	1	1	169.90	31.79	30	322	363	1.03	-21.5	169.9	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37105	FOOTHIL1	69.00	1	1	166.92	30.80	30	322	363	1.03	-19.8	166.9	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37115	ORANGVL2	69.00	1	1	156.98	28.81	30	322	363	1.03	-22.0	157.0	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00
37122	LAKE 2	69.00	1	1	153.01	28.81	30	322	363	1.03	-21.4	153.0	0.000	0.0400	0.0600	0.50	0.0800	1.00	1.00	12	0.90	1.10	0.00625	1.03	1.05	30.00	5.00

FmA	FmB	FmC	FmD	Fel	PFel	Vd1	Vd2	Pfs	P1e	P1c	P2e	P2c	Pfrq	Q1e	Q1c	Q2e	Q2c	Qfrq	MtpA	MtpB	MtpC	MtpD	bss100	fdVmin	fdVmax	maxdrop	fd_x-r	maxloss	PFt
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85
0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000	3.00	3.00	3.00	1.00	0.0000	0.95	1.05	0.06	1.50	0.07	0.85

The CMPSN table (Figure 3) is a reduced copy of the CMPLDW table, containing only those columns which brought from a *load* table and those which describe load composition data (model component fractions) and several parameters of electronic and zip load components. This table is offered just for more convenient review of composition data.

Figure 3. CMPSN table in the *CASE.exs* file

BUS-NO	NAME	KV	ID	ST	PLOAD	QLOAD	AREA	ZONE	FmA	FmB	FmC	FmD	Fel	PFel	Vd1	Vd2	Pfs	P1e	P1c	P2e	P2c	Pfrq	Q1e	Q1c	Q2e	Q2c	Qfrq
37117	POCKET 2	69.00	1	1	186.79	34.78	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37121	ELKGROV2	69.00	1	1	184.80	34.78	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37106	HEDGE 1	69.00	1	1	183.81	34.78	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37109	HURLEY 2	69.00	1	1	179.84	33.78	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37123	NATOMAS	69.00	1	1	179.84	33.78	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37108	HURLEY 1	69.00	1	1	178.84	33.78	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37114	ORANGVL1	69.00	1	1	177.85	32.79	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37101	CARMICAL	69.00	1	1	175.86	32.79	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37116	POCKET 1	69.00	1	1	172.88	32.79	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37107	HEDGE 3	69.00	1	1	169.90	31.79	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37105	FOOTHIL1	69.00	1	1	166.92	30.80	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37115	ORANGVL2	69.00	1	1	156.98	28.81	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000
37122	LAKE 2	69.00	1	1	153.01	28.81	30	322	0.14	0.14	0.14	0.26	0.15	1.000	0.60	0.50	-0.99	2.00	0.30	1.00	0.70	1.00	2.00	-0.80	1.00	1.80	-1.000

The PFLOW table (Figure 4) is convenient for comparing power flow parameters in the appended part of the case. The table includes the columns with V, P and Q at the original transmission buses, at the low side of the added transformer and at the end of the added feeder.

Figure 4. PFLOW table in the *CASE.EXS* file

BUS-NO	NAME	KV	ID	ST	PLOAD	QLOAD	AREA	ZONE	OWN	V-PU	DEG	TAP	Bfl	Vssh	Vssl	Vfbeg	Vfend	Pssh	Pssl	Pfbeg	Pfend	Qssh	Qssl	Qfbeg	Qfend
37117	POCKET 2	69.00	1	1	186.79	34.78	30	322	363	1.04	-18.8	1.006	0.437	1.040	1.036	1.036	0.983	186.79	186.79	186.79	179.68	34.78	21.92	68.84	58.17
37121	ELKGROV2	69.00	1	1	184.80	34.78	30	322	363	1.03	-20.6	1.013	0.436	1.029	1.031	1.031	0.977	184.80	184.80	184.80	177.69	34.78	21.76	68.15	57.48
37106	HEDGE 1	69.00	1	1	183.81	34.78	30	322	363	1.02	-22.1	1.019	0.433	1.023	1.032	1.032	0.978	183.81	183.81	183.81	176.75	34.78	21.69	67.80	57.21
37109	HURLEY 2	69.00	1	1	179.84	33.78	30	322	363	1.03	-22.6	1.013	0.424	1.030	1.032	1.032	0.979	179.84	179.84	179.84	172.94	33.78	21.15	66.30	55.95
37123	NATOMAS	69.00	1	1	179.84	33.78	30	322	363	1.03	-19.9	1.013	0.423	1.031	1.033	1.033	0.979	179.84	179.84	179.84	172.94	33.78	21.17	66.31	55.97
37108	HURLEY 1	69.00	1	1	178.84	33.78	30	322	363	1.03	-20.3	1.013	0.421	1.030	1.032	1.032	0.979	178.84	178.84	178.84	171.97	33.78	21.21	66.02	55.72
37114	ORANGVL1	69.00	1	1	177.85	32.79	30	322	363	1.03	-21.9	1.013	0.420	1.032	1.034	1.034	0.981	177.85	177.85	177.85	171.05	32.79	20.35	65.28	55.09
37101	CARMICAL	69.00	1	1	175.86	32.79	30	322	363	1.03	-22.3	1.006	0.417	1.034	1.030	1.030	0.977	175.86	175.86	175.86	169.09	32.79	20.54	64.76	54.60
37116	POCKET 1	69.00	1	1	172.88	32.79	30	322	363	1.04	-21.9	1.006	0.406	1.036	1.031	1.031	0.978	172.88	172.88	172.88	166.23	32.79	20.77	63.95	53.98
37107	HEDGE 3	69.00	1	1	169.90	31.79	30	322	363	1.03	-21.5	1.013	0.397	1.034	1.036	1.036	0.983	169.90	169.90	169.90	163.43	31.79	19.96	62.63	52.92
37105	FOOTHIL1	69.00	1	1	166.92	30.80	30	322	363	1.03	-19.8	1.006	0.397	1.034	1.030	1.030	0.977	166.92	166.92	166.92	160.49	30.80	19.18	61.32	51.68
37115	ORANGVL2	69.00	1	1	156.98	28.81	30	322	363	1.03	-22.0	1.013	0.372	1.031	1.033	1.033	0.980	156.98	156.98	156.98	150.98	28.81	17.81	57.55	48.54
37122	LAKE 2	69.00	1	1	153.01	28.81	30	322	363	1.03	-21.4	1.013	0.360	1.030	1.032	1.032	0.979	153.01	153.01	153.01	147.14	28.81	18.07	56.45	47.64

More comprehensive power flow analysis for the cases, expanded by transformers (*case-xfmr.sav*) and by transformers and feeders (*case-fder.sav*), can be conducted using the corresponding PSLF files, generated along with the user-defined tables. Those files allow any types of selections, record viewing, scanning, etc.

The tables are eventually populated by numbers for loads in the user specified areas and zones, for certain ranges of load MWs, nominal voltages, etc. The generated CMPLDW records (Figure 5) are also produced for the specified loads.

Figure 5. CMPLDW .dyd records

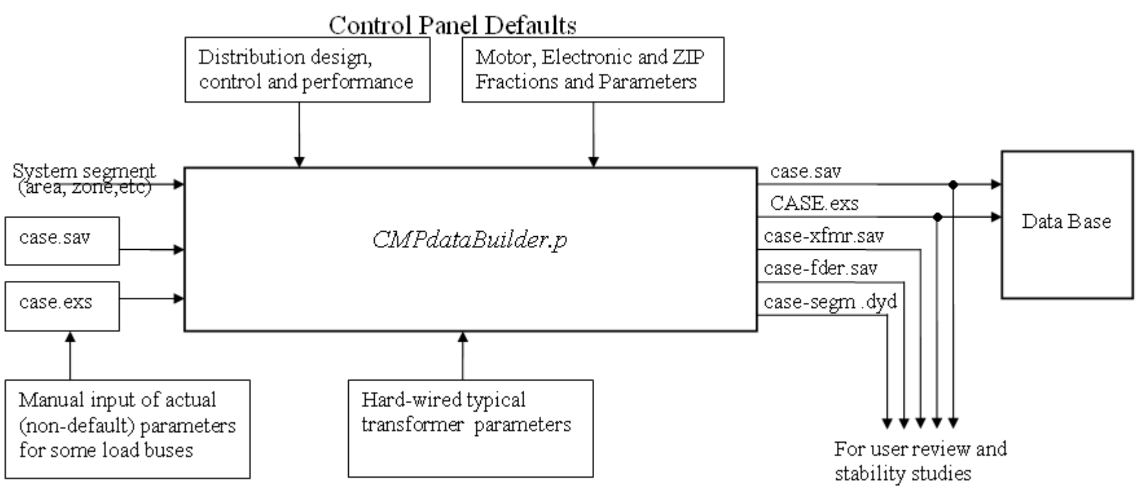
```
cmpldw   54002   "MAYERTH9"  138  "99"    : #1  mva=10  /
   "Bss" 0 "Rfdr" 0.05 "Xfdr" 0.075 "Fb" 0.5 "Xxf" 0.08 "Tfixhs" 1 "Tfixls" 1 "LTC" 1 "Tmin" 0.9 "Tmax" 1.1  /
   "step" 0.00625 "Vmin" 1.03 "Vmax" 1.05 "Tdel1" 30 "Tdel2" 5 "Rcmp" 0 "Xcmp" 0  /
   "FmA" 0.14 "FmB" 0.14 "FmC" 0.14 "FmD" 0.26 "Fel" 0.15  /
   "PFel" 1 "Vd1" 0.6 "Vd2" 0.5  /
   "Pfs" -0.985 "P1e" 2 "P1c" 0.3 "P2e" 1 "P2c" 0.7 "Pfrq" 1  /
   "Q1e" 2 "Q1c" -0.8 "Q2e" 1 "Q2c" 1.8 "Qfrq" -1  /
  "MtpA" 3   "MtpB" 3   "MtpC" 3   "MtpD" 1   /
  "LfmA" 0.8 "RsA" 0.03 "LsA" 1.8 "LpA" 0.19 "LppA"   0.14 /
   "TpoA" 0.2 "TppoA" 0.0026 "HA"  0.3 "etrqA" 0 /
   "Vtr1A" 0.8 "Ttr1A" 5.0  "Ftr1A" 1 "Vrc1A" 1 "Trc1A" 9999 /
   "Vtr2A" 0.8 "Ttr2A" 999.0  "Ftr2A" 1 "Vrc2A" 1 "Trc2A" 9999  /
  "LfmB" 0.8 "RsB" 0.03 "LsB" 1.8 "LpB" 0.19 "LppB"   0.14 /
   "TpoB" 0.2 "TppoB" 0.0026 "HB"   1 "etrqB" 2 /
   "Vtr1B" 0.7 "Ttr1B" 9999  "Ftr1B" 1 "Vrc1B" 1 "Trc1B" 9999 /
   "Vtr2B" 0.8 "Ttr2B" 9999  "Ftr2B" 1 "Vrc2B" 1 "Trc2B" 9999  /
  "LfmC" 0.8 "RsC" 0.03 "LsC" 1.8 "LpC" 0.19 "LppC"   0.14 /
   "TpoC" 0.2 "TppoC" 0.0026 "HC"   0.1 "etrqc" 2 /
   "Vtr1C" 0.7 "Ttr1C" 9999 "Ftr1C" 1 "Vrc1C" 1 "Trc1C" 9999 /
   "Vtr2C" 0.8 "Ttr2C" 9999 "Ftr2C" 1 "Vrc2C" 1 "Trc2C" 9999  /
  "LfmD"  1 "CompPF" 0.97 /
   "Vstall" 0.6 "Rstall" 0.09  "Xstall" 0.09 "Tstall" 0.03  "Frst" 0 "Vrst" 0.9 "Trst" 0.4 /
   "fuvr" 0 "vtr1" 0.8 "ttr1" 0.2 "vtr2" 0.9 "ttr2" 5 /
   "Vc1off" 0.5 "Vc2off" 0.4 "Vc1on" 0.6 "Vc2on" 0.6 /
   "Tth" 15 "Th1t" 0.7 "Th2t" 1.9 "tv" 0.025
cmpldw   54003   "COLINTO9"  138  "99"    : #1  mva=10  /
   "Bss" 0 "Rfdr" 0.043333 "Xfdr" 0.065 "Fb" 0.5 "Xxf" 0.08 "Tfixhs" 1 "Tfixls" 1 "LTC" 1 "Tmin" 0.9 "Tmax" 1.1  /
   "step" 0.00625 "Vmin" 1.03 "Vmax" 1.05 "Tdel1" 30 "Tdel2" 5 "Rcmp" 0 "Xcmp" 0  /
   "FmA" 0.14 "FmB" 0.14 "FmC" 0.14 "FmD" 0.26 "Fel" 0.15  /
   "PFel" 1 "Vd1" 0.6 "Vd2" 0.5  /
   "Pfs" -0.985 "P1e" 2 "P1c" 0.3 "P2e" 1 "P2c" 0.7 "Pfrq" 1  /
   "Q1e" 2 "Q1c" -0.8 "Q2e" 1 "Q2c" 1.8 "Qfrq" -1  /
  "MtpA" 3   "MtpB" 3   "MtpC" 3   "MtpD" 1   /
  "LfmA" 0.8 "RsA" 0.03 "LsA" 1.8 "LpA" 0.19 "LppA"   0.14 /
   "TpoA" 0.2 "TppoA" 0.0026 "HA"  0.3 "etrqA" 0 /
   "Vtr1A" 0.8 "Ttr1A" 5.0  "Ftr1A" 1 "Vrc1A" 1 "Trc1A" 9999 /
   "Vtr2A" 0.8 "Ttr2A" 999.0  "Ftr2A" 1 "Vrc2A" 1 "Trc2A" 9999  /
  "LfmB" 0.8 "RsB" 0.03 "LsB" 1.8 "LpB" 0.19 "LppB"   0.14 /
   "TpoB" 0.2 "TppoB" 0.0026 "HB"   1 "etrqB" 2 /
   "Vtr1B" 0.7 "Ttr1B" 9999  "Ftr1B" 1 "Vrc1B" 1 "Trc1B" 9999 /
   "Vtr2B" 0.8 "Ttr2B" 9999  "Ftr2B" 1 "Vrc2B" 1 "Trc2B" 9999  /
  "LfmC" 0.8 "RsC" 0.03 "LsC" 1.8 "LpC" 0.19 "LppC"   0.14 /
   "TpoC" 0.2 "TppoC" 0.0026 "HC"   0.1 "etrqc" 2 /
   "Vtr1C" 0.7 "Ttr1C" 9999 "Ftr1C" 1 "Vrc1C" 1 "Trc1C" 9999 /
   "Vtr2C" 0.8 "Ttr2C" 9999 "Ftr2C" 1 "Vrc2C" 1 "Trc2C" 9999  /
  "LfmD"  1 "CompPF" 0.97 /
   "Vstall" 0.6 "Rstall" 0.09  "Xstall" 0.09 "Tstall" 0.03  "Frst" 0 "Vrst" 0.9 "Trst" 0.4 /
   "fuvr" 0 "vtr1" 0.8 "ttr1" 0.2 "vtr2" 0.9 "ttr2" 5 /
   "Vc1off" 0.5 "Vc2off" 0.4 "Vc1on" 0.6 "Vc2on" 0.6 /
   "Tth" 15 "Th1t" 0.7 "Th2t" 1.9 "tv" 0.025
cmpldw   54004   "WESTLOC9"  138  "99"    : #1  mva=10  /
   "Bss" 0 "Rfdr" 0.04 "Xfdr" 0.06 "Fb" 0.5 "Xxf" 0.08 "Tfixhs" 1 "Tfixls" 1 "LTC" 1 "Tmin" 0.9 "Tmax" 1.1  /
   .............................................................................................
```

There are three ways of inserting data in the CMPLDW table:

1) Default values, hard-wired in the *CMPdataBuilder.p* program: minimum and maximum (Tmin=0.9, Tmax=1.1) taps, variable tap size (step=0.00625), minimum transformer capacity (10 MVA).
2) EPCL Control Panel defined default values – a) description of system segment to be processed (areas, zones, ID's, minimum load voltage, minimum load MW), b) description of a user view on most common feeder and transformer design, voltage control arrangements and performance requirements, c) load model component composition (default composition values can be replaced with bus specific values using the *cmpsn_by_bus.p* program), motor parameters.
3) Values, calculated by the *CMPdataBuilder.p* program – transformer MVA base and feeder impedances. These calculations involve data listed in (2) as well as load V, P and Q, which are brought to the CMPLDW table from the case. The calculations are conducted only for heavy "design" cases and stay unchanged in less loaded "study" cases, when user specifies *study = 1* prior to running *CMPdataBuilder.p*.
4) If the user has a specific knowledge about any parameter (other than mentioned in item 3), its value can be inserted manually in the CMPLDW table and this manual input overrides a default value. Default values are accepted only if a previous value is zero (not populated yet). *CMPdataBuilder.p* can be and should be rerun after manual update of the calculated values.

Figure 6 illustrates data conversion, provided by CMPdataBuilder.p.

Figure 6. CMPLDW Data Builder



More detailed description of data, processed by *CMPdataBuilder.p*, is given in Table 1.

Table 1. Data.

Description of variables, defining CMPLDW inputs - page 1

	Description	UNITS	CMPLDW input?	Source	Kept unchanged in "study" case?	examples of control panel defaults	Specific values
BUS-NO			yes	Power flow case			
NAME			yes	Power flow case			
kV			yes	Power flow case			
ID			yes	Power flow case			
ST			no	Power flow case	no		
PLOAD		MW	yes	Power flow case	no		
QLOAD		MVAr	yes	Power flow case	no		
AREA			no	Power flow case			
ZONE			no	Power flow case			
OWN			no	Power flow case			
Vm	Voltage magnitude	p.u.	yes	Power flow case	no		
Va	Voltage angle	degree	yes	Power flow case	no		
MVAbLL	Transformer MVAbase	MW	yes/no[1]	*CMPdataBuilder.p* calculations[1]	yes		
Bss	Substation shunt	p.u.on xfmr base	yes	*CMPdataBuilder.p* calc,using bss100	no		
Rfdr	Feeder equiv. resist.	p.u.on xfmr base	yes	*CMPdataBuilder.p* calculations	changes disabled by fixing Xfdr		
Xfdr	Feeder equiv. react.	p.u.on xfmr base	yes	*CMPdataBuilder.p* calculations	yes		-1 if no feeder needed
Fb	Fraction of feeder shunt capacitance at substation end		yes	Control panel default or manual input	changes disabled by fixing Xfdr	0.5	
Xxf	Substation transformer reactance	p.u.on xfmr base	yes	Control panel default or manual input	changes disabled by fixing MVAbLL	0.08	-1 if no xfrmr needed

[1] - *CMPdataBuilder.p* calculates positive *MVAbLL* based on component Loading Level (*LL*). The same *MVAbLL* variable is initially populated by the negative *LL* values (opposite to given in a control panel)**.** *CMPdataBuilder.p* recognizes negative *MVAbLL* as *LL* and calculates positive *MVAbLL*. After *MVAbLL* becomes positive as result of calculations or manual input, it will not be affected by *CMPdataBuilder.p* executions. The CMPLDW model capability to convert *LL*<0 *to MVAb*>0 is not used because CMPLDW calculates *MVAb* without counting a minimum transformer/feeder capacity (10 MVA).

Description of variables, defining CMPLDW inputs – page 2

	Description	UNITS	CMPLDW input?	Source	Kept unchanged in "study" case?	examples of control panel defaults	Specific values
Tfixhs	Transformer High Side Fixed Tap	p.u.	yes	Control panel default or manual input	no, but changes unreasonable	1	
Tfixls	Transformer Low Side Fixed Tap	p.u.	yes	Control panel default or manual input	no, but changes unreasonable	1	
LTC	LTC flag		yes	Control panel default or manual input	no, but changes unreasonable	12 [2]	12-enable, 11-disable
Tmin	Minimum variable tap	p.u.	yes	Hard-wired default or manual input	no, but changes unreasonable	0.9	
Tmax	Maximum variable tap	p.u.	yes	Hard-wired default or manual input	no, but changes unreasonable	1.1	
step	Variable tap step size	p.u.	yes	Hard-wired default or manual input	no, but changes unreasonable	0.00625	
Vmin	Minimum low-side voltage	p.u.	yes	Control panel default or manual input	no	1.03	
Vmax	Maximum low-side voltage	p.u.	yes	Control panel default or manual input	no	1.05	
Tdel1	Time delay to initiate tap adjustment	sec	yes	Control panel default or manual input	no, but changes unreasonable	30	
Tdel2	Time delay between tap steps	sec	yes	Control panel default or manual input	no, but changes unreasonable	5	
Rcmp	Transformer LTC compensating resistance	p.u.on xfmr base	yes	Control panel default or manual input	no	0	
Xcmp	Transformer LTC compensating reactance	p.u.on xfmr base	yes	Control panel default or manual input	no	0	
FmA	Fraction of Motor A load		yes	Control panel default or *cmpsn-by-bus.p* output	no	0.14	

[2] - *CMPdataBuilder.p* transforms input codes 12 and 11 to 1 and 0 in CMPLDW dyd records.

Description of variables, defining CMPLDW inputs – page 3

	Description	UNITS	CMPLDW input?	Source	Kept unchanged in "study" case?	examples of control panel defaults	Specific values
FmB	Fraction of Motor B load		yes	Control panel default or *cmpsn-by-bus.p* output	no	0.14	
FmC	Fraction of Motor C load		yes	Control panel default or *cmpsn-by-bus.p* output	no	0.14	
FmD	Fraction of Motor D load		yes	Control panel default or *cmpsn-by-bus.p* output	no	0.26	
Fel	Fraction of Power Electronic load		yes	Control panel default or *cmpsn-by-bus.p* output	no	0.15	
PFel	Power factor for Power Electronic load		yes	Control panel default or manual input	no, but changes unreasonable	1.0	
Vd1	Load start decrease voltage	p.u.	yes	Control panel default or manual input	no, but changes unreasonable	0.6	
Vd2	Load becomes zero voltage	p.u.	yes	Control panel default or manual input	no, but changes unreasonable	0.5	
Pfs	Power factor of static load component		yes	Control panel default or manual input	no	-0.985	
P1e	Static load - exponent of first P term		yes	Control panel default or manual input	no	2	
P1c	Static load - coefficient of first P term		yes	Control panel default or manual input	no	0.3	
P2e	Static load - exponent of second P term		yes	Control panel default or manual input	no	1	

Description of variables, defining CMPLDW inputs – page 4

	Description	UNITS	CMPLDW input?	Source	Kept unchanged in "study" case?	examples of control panel defaults	Specific values
P2c	Static load - coefficient of second P term		yes	Control panel default or manual input	no	0.7	
Pfrq	Frequency sensitivity factor for P		yes	Control panel default or manual input	no	1	
Q1e	Static load - exponent of first Q term		yes	Control panel default or manual input	no	2	
Q1c	Static load - coefficient of first Q term		yes	Control panel default or manual input	no	-0.8	
Q2e	Static load - exponent of second Q term		yes	Control panel default or manual input	no	1	
Q2c	Static load - coefficient of second Q term		yes	Control panel default or manual input	no	1.8	
Qfrq	Frequency sensitivity factor for Q		yes	Control panel default or manual input	no	-1	
MtpA	Type of motor A - 3-phase compressors[3]		yes	Control panel default or manual input	no	3	
MtpB	Type of motor B - 3-phase fans[3]		yes	Control panel default or manual input	no	3	
MtpC	Type of motor C - 3-phase pumps[3]		yes	Control panel default or manual input	no	3	
MtpD	Type of motor D – single-phase motors[3]		yes	Control panel default or manual input	no	1	

Description of variables, defining CMPLDW inputs – page 5

	Description	UNITS	CMPLDW input?	Source	Kept unchanged in "study" case?	examples of control panel defaults	Specific values
bss100	Substation shunt	p.u.on 100 MVA base	no	Manual input	no		
fdVmin	Minimum feeder-end voltage	p.u.	no	Control panel default or manual input	changes disabled by fixing Xfdr	0.95	
fdVmax	Maximum feeder-end voltage	p.u.	no	Control panel default or manual input	changes disabled by fixing Xfdr	1.05	
maxdrop	Maximum feeder voltage drop	p.u.	no	Control panel default or manual input	changes disabled by fixing Xfdr	0.06	
fd_x-r	Feeder X/R ratio		no	Control panel default or manual input	changes disabled by fixing Xfdr	1.5	
maxloss	Maximum feeder losses	p.u. on fdr. flow base	no	Control panel default or manual input	changes disabled by fixing Xfdr	0.07	
PFt	Typical non-compensated end-user power factor		no	Control panel default or manual input	changes disabled by fixing Xfdr	0.85	
Pmin	Minimum P_{load} for CMPLDW	MW	no	Control panel default	no, but changes unreasonable	3	
Vtmin	Min. voltage to add transform	kV	no	Control panel default	no, but changes unreasonable	30	
Vdmin	Min. voltage to add feeder	kV	no	Control panel default	no, but changes unreasonable	4	

[3] – CMPLDW table does not have columns for motor parameters. *CMPdataBuilder.p* transfers these control panel-defined parameters directly to the dyd records.

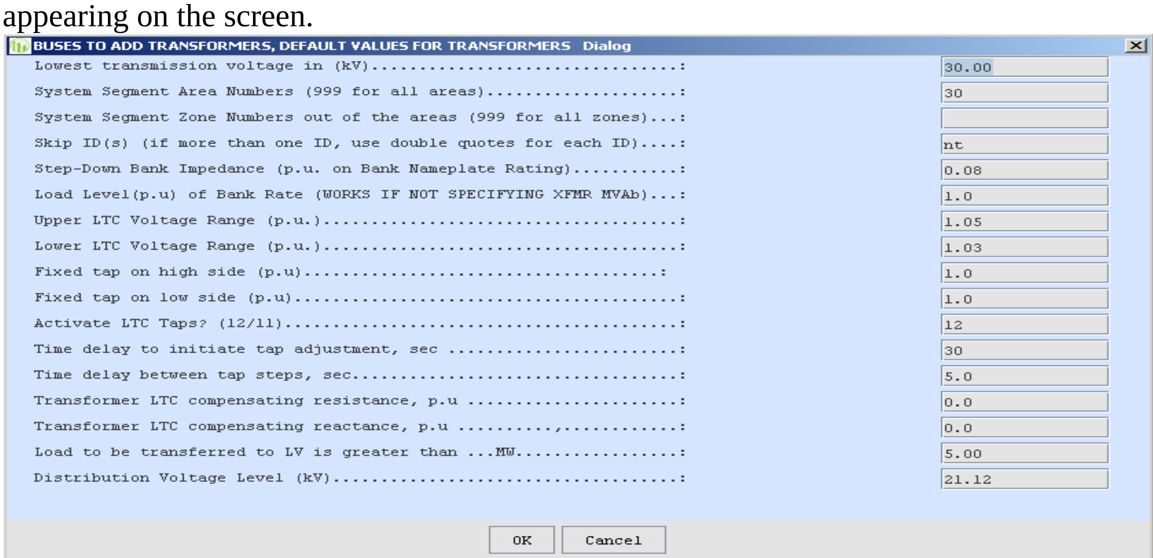
4. Running *CMPdataBuilder.p*

Have program setup completed in accordance with Section 2.

Select the EPCL script *CMPdataBuilder.p*. The first input panel appears on the screen. The first field of the panel is designated for a file name. To enter the file name, select a field and type the name, or **click "OK"** and **select** your file from the working directory, which appears on the screen. To reselect a file from the directory, clean the field first using the spacebar.

The "Y" values in the third and fourth fields bring very detailed information about the case solving process and the iterative search of feeder parameters. This is usually unnecessary and the "N" values are recommended.

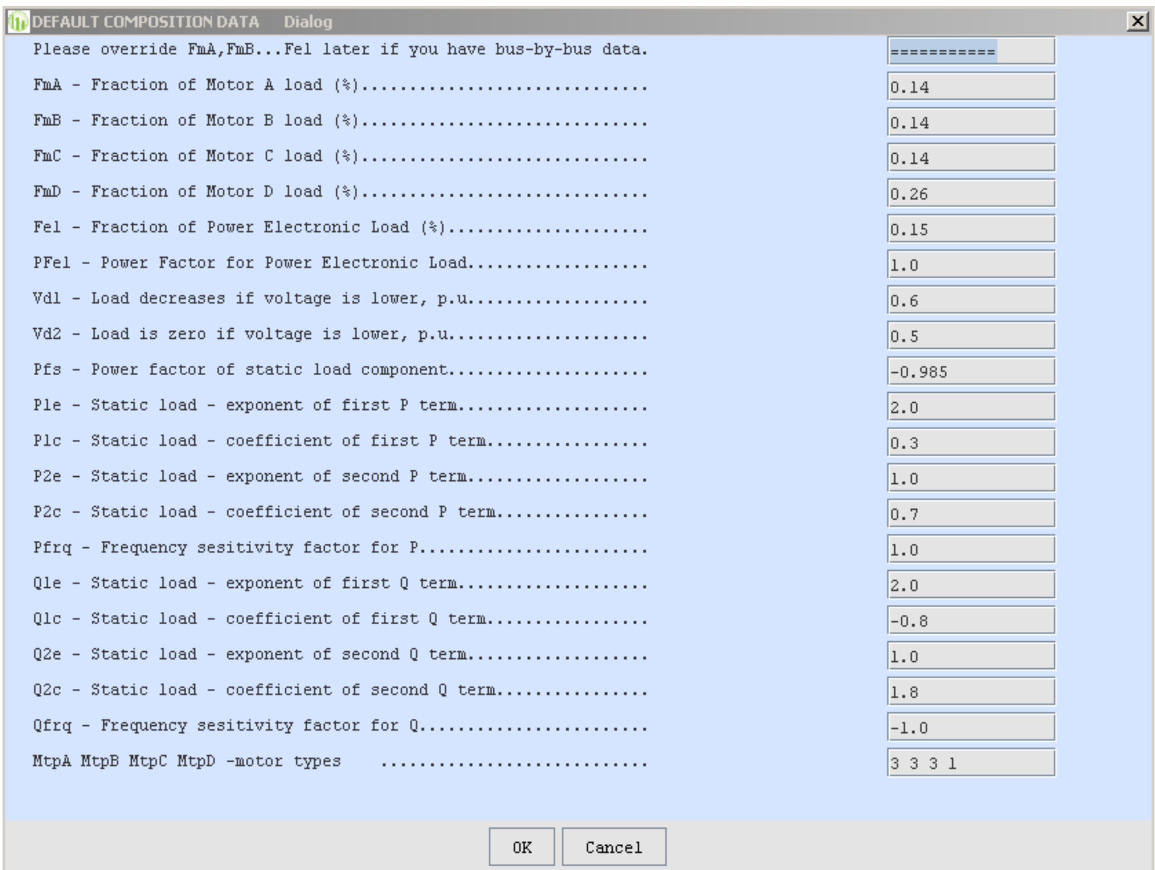
The forth parameter should be "0" when building CMPLDW data for a "design" case which features very heavy loads to be sure the calculated transformer and feeder parameters provide appropriate distribution system performance for any case. The calculated for a "design" case transformer and feeder parameters stay unchanged in less loaded "study" cases, when user replaces "0" by "1" (*study=1*) prior to running the program. This means that the dyd records for a "study" case could differ from the "design" case only in parts of composition data and (less likely) voltage control targets. When all field values are entered, **click "OK"** and review the second control panel, appearing on the screen.



Identify buses in your control segment where loads should be transferred to the low side of additional transformers. Use the fields for areas, zones, skip IDs, lowest transmission voltages, minimum load MWs. Some loads can be also excluded later from transferring to the low side by placing *Xxf=-1* in the corresponding line of the generated CMPLDW table.

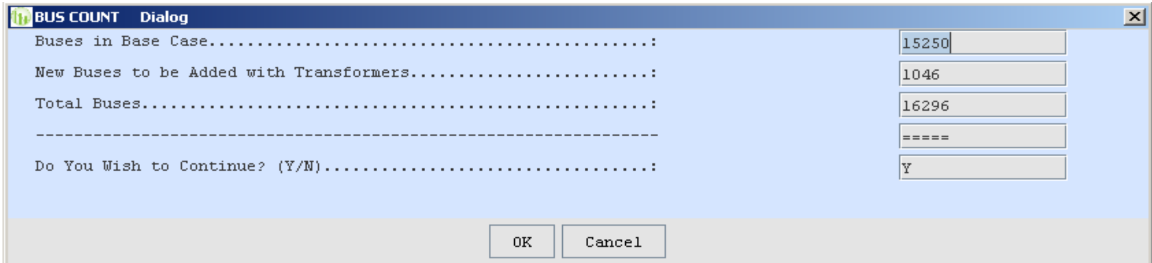
Replace the default transformer parameters in the control panel by more appropriate for your control segment. Refer to Table 1 for parameter descriptions and reasons for changes. Remember about the possibility to override default values in some lines of the generated CMPLDW table by more specific values.

Click "OK" and review the default composition control panel.

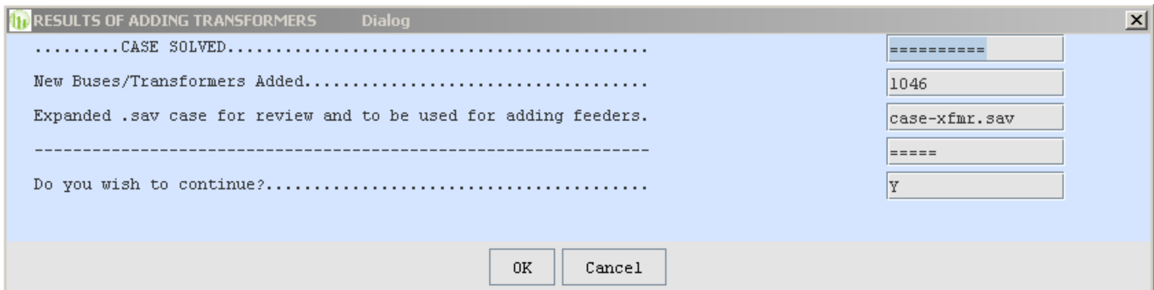


The defaults values in this panel will be populated for all loads in the specified system segment. Be sure the table values are appropriate for the case season, day, hour, weather, etc. Please also note that if bus-by-bus composition data is available, the populated default composition data can be overridden later using the *cmpsn-by-bus.p* EPCL program (see Section 5).

Click "OK" and review the Motor A data panel. **Make corrections** if needed.
Do the same for motors B, C, and D.
Click "OK" and review the new bus count message.

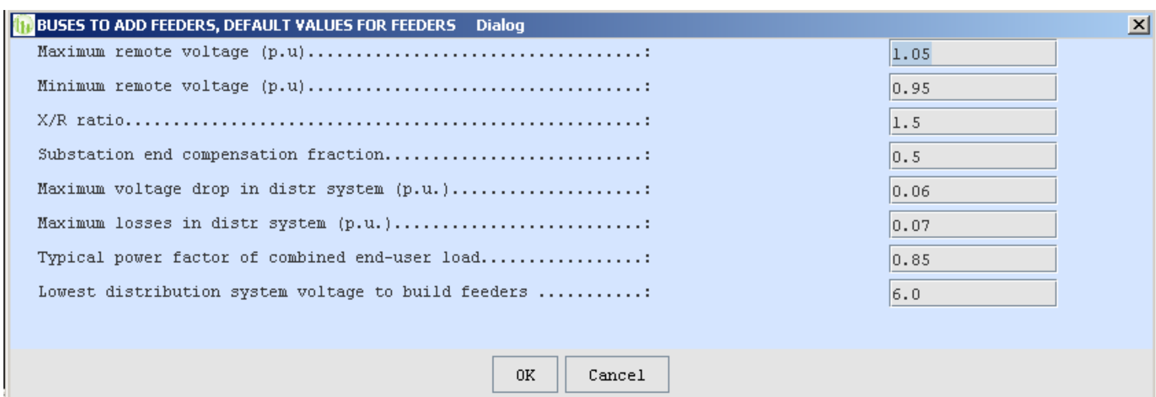


Click "OK" and wait for the next message, confirming convergence of the expanded case.



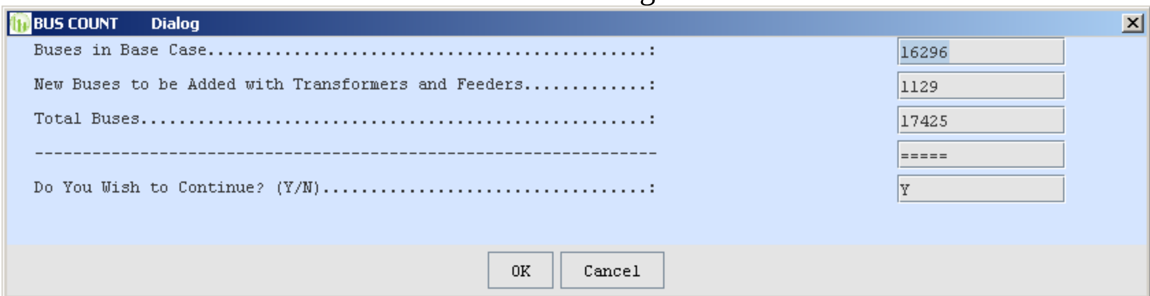
Review the expanded *case-xfmr.sav* case, where loads are transferred from the "XXXXX" transmission bus to the 10XXXXX bus on the secondary side of the added step-down transformer. If several load IDs are connected to XXXXX, they are transferred to 10XXXXX, 11XXXXX, 12XXXXX, etc.

Click "OK" and review the default values, which define the design, voltage control conditions and performance requirements for the distribution feeders.

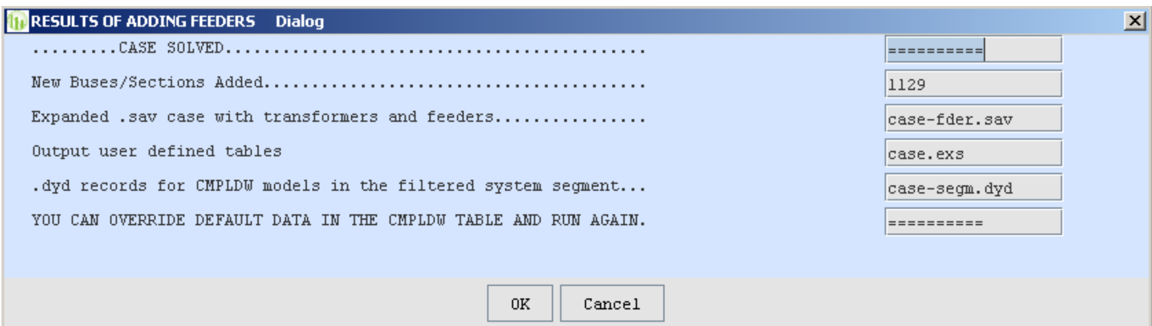


Replace the default feeder parameters in the control panel by more appropriate for your control segment. This segment boundaries for feeder additions can be wider than for transformer additions because some loads in original base cases can be connected to distribution level buses. Refer to Table 1 for parameter descriptions and reasons for changes. Remember about the possibility to override default values in some lines of the generated CMPLDW table by more specific values. There is no default for the substation capacitor susceptance, which can be specified only in the CMPLDW table. For the user convenience, this susceptance is specified by the *bss100* value on the 100 MVA base. The program converts this value to the *Bss* value on the transformer/feeder MVA base.

Click "OK" and review the new bus count message.



Click "OK" and wait for the next message, confirming convergence of the expanded case with transformers and feeders and providing names of the generated .sav and .dyd files.



Click "OK" to finish the process with the default values.

Review the obtained CMPLDW, CMPSN and PFLOW tables in the produced *case.exs* extension file and the CMPLDW records in the *case-segm.dyd* file. **Review** the expanded *case-fder.sav* case with transformers and feeders added and loads transferred from the 10XXXXX, 11XXXXX, 12XXXXX, etc. buses to the 20XXXXX, 21XXXXX, 22XXXXX, etc. feeder-end buses. Some **corrections** in the CMPLDW table (not in *case.sav*) might be needed if any inappropriate voltages or expanded case divergence are indicated. Some default values, appearing in the CMPLDW table, can be manually replaced by load-specific values. Run *CMPdataBuilder.p* again after corrections. **Repeat** this process as many times as needed. There is no need for re-entering the default values in the control panels when repeating the process. All values are saved in the working directory using the *remember_cmpsn*, *remember_fder*, *remember_xfmr*, *remember_A remember_B, remember_C and remember_D* files, and *CMPdataBuilder.p* automatically places the previous run values into the control panels. The original default values can be restored by deleting the *remember* files.

If different default values are needed for some sub-segments, the described process should be **executed sequentially** for each sub-segment.

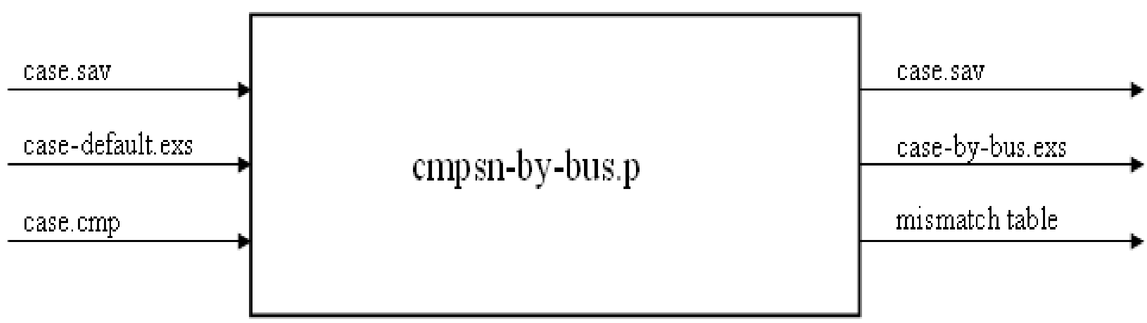
After the *case-xfmr.sav* and *case-fder.sav* cases become satisfactory, they can be deleted. The *case.exs* file with the CMPLDW, CMPSN and PFLOW tables can be archived for later use with other base cases. This is particularly important if many manual changes are made in the CMPLDW table to count specific conditions for some loads. The main product of the described process is the *case-segm.dyd* file. This file records should be pasted to the dyd file containing all dynamic models for the entire WECC or its investigated part. If the developed dyd records should be delivered to a study coordinator, the “segm” suffix in the file name should be replaced by a unique descriptor of the processed segment, e.g. *08hs1-segm.dyd* to *08hs1-PGE.dyd*.

5. Running *cmpsn-by-bus.p*

This program is used for overriding default segment-average composition data if load-specific data is available. The program should be executed after original formation of the CMPLDW table is completed.

Figure 7 illustrates insertion of the load-specific composition data, provided in the *case.cmp* file, to the *case-default.exs* extension file, originally populated be the default composition data.

Figure 7. Load-specific composition data insertion



Besides the *case-by-bus.exs* file, the program produces a mismatch table, which indicates inconsistencies between the *case.cmp* file and the *case-default.exs* file. These inconsistencies are possible if *the case.cmp* file is created for a system configuration with differences in designation of bus numbers, load IDs, nominal voltages, etc.

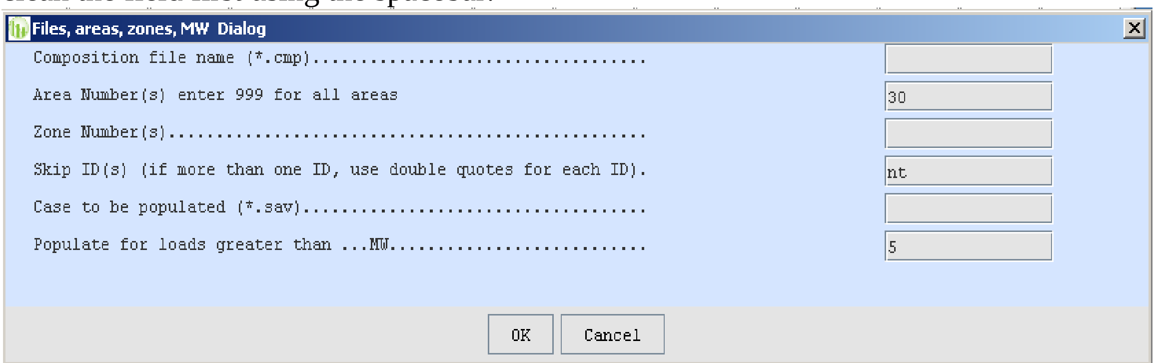
There are different methodologies for obtaining the load-specific composition data. Discussions of those methodologies are beyond the scope of this manual. However, application of the *cmpsn-by-bus.p* program is possible with the following arrangement of the composition file:

```
                                      MotA   MotB  MotC   MotD Electr. ZIP
30537,NDUBLIN ,230,1,30,316,0.133,0.125,0.012,0.367,0.171,0.192
30545,ROSSMOOR,230,1,30,308,0.092,0.116,0.003,0.444,0.165,0.180
30545,ROSSMOOR,230,2,30,308,0.092,0.116,0.003,0.444,0.165,0.180
30554,CASTROVL,230,2,30,316,0.101,0.118,0.008,0.425,0.166,0.182
30554,CASTROVL,230,1,30,316,0.101,0.118,0.008,0.425,0.166,0.182
30555,SANRAMON,230,6,30,316,0.197,0.136,0.015,0.259,0.181,0.212
30555,SANRAMON,230,5,30,316,0.197,0.136,0.015,0.259,0.181,0.212
30555,SANRAMON,230,4,30,316,0.197,0.136,0.015,0.259,0.181,0.212
30555,SANRAMON,230,3,30,316,0.197,0.136,0.015,0.259,0.181,0.212
30556,CV BART ,230,1,30,346,0.200,0.200,0.300,0.000,0.150,0.150
30561,TASSAJAR,230,2,30,308,0.059,0.112,0.008,0.495,0.159,0.168
```

Copy the composition file into the working directory.

Select the EPCL script *cmpsn-by-bus.p.* The input panel appears on the screen.

The first field of the panel is designated for a composition file name. To enter the file name, select a field and type the name, or **click "OK"** and **select** your file from the working directory, which appears on the screen. To reselect a file from the directory, clean the field first using the spacebar.



Enter the system segment descriptors (areas, zones, skip IDs and minimum MWs) the same as was used running *CMPdataBuilder.p*. **Enter** the name of the case to be populated by typing or selecting from the directory.
Click "OK" and wait until the program completes all insertions and displays all the inconsistencies on the screen and in the *mismatch.log* file.
Review the inconsistencies, **make** corresponding corrections in the CMPLDW table and **run** *CMPdataBuilder.p* to accommodate these corrections in the dyd records.

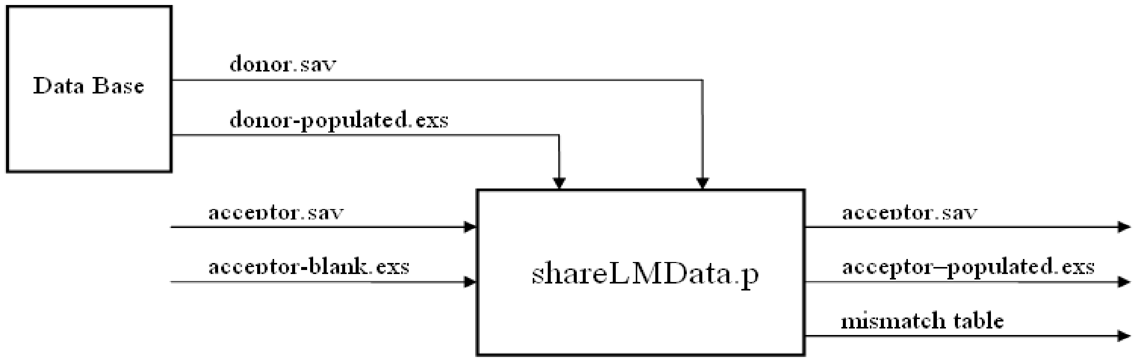
6. Running *shareLMData.p*

The developed power flow case extension with the user-defined tables can be archived and later used for population of another case with the similar load composition, e.g. for identical season/day/hour cases related to the following one or two years. This would help to minimize manual changes in the CMPLDW table to count specific conditions for some loads.

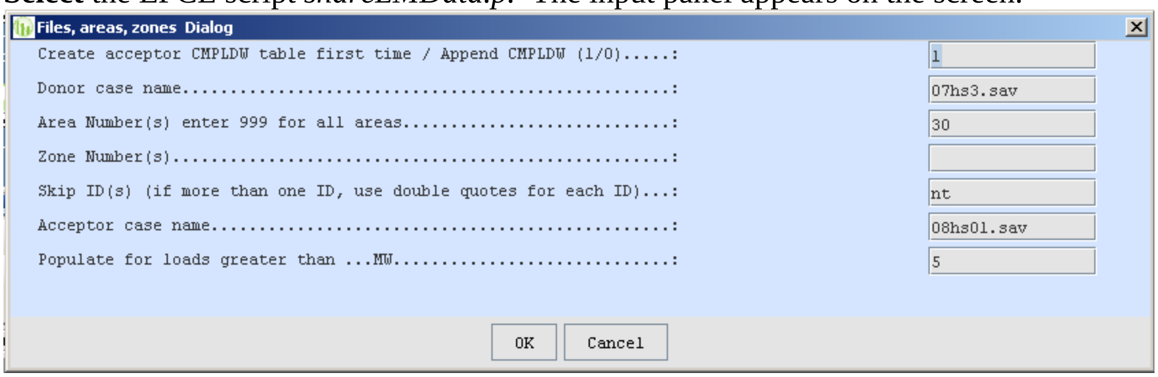
The *shareLMData.p* program transfers data from the CMPLDW table of one case (donor) to the CMPLDW table of another case (acceptor). It is generally assumed that distribution systems of these two cases feature the same design characteristics of step-down transformers and feeders (*MVAb, Rfdr* and *Xfdr*). With this assumption, the completion of data building for the acceptor case can be accomplished by running *CMPdataBuilder.p* in the "study" mode (*study=1*). When the acceptor case may need greater ratings, *CMPdataBuilder.p* should be run in the "design" mode (*study=0*). In this mode, feeder parameters will be recalculated accordingly to the new case loads. Recalculation of transformer *MVAb* would work only after entering *MVAbLL=0* for all loads. This action will override all manually entered *MVAbLL* values. Therefore, they should be manually entered again.

Figure 8 illustrates *shareLMData.p* operation.

Figure 8. Donor – Acceptor Data Transfer



Select the EPCL script *shareLMData.p.* The input panel appears on the screen.



"1" in the first field of the panel indicates that an extension file for the acceptor case was not created earlier. This allows cleaning of the extension tables. "0" in the first field should be used for appending data by system segments, when cleaning should not be used because that would delete previously transferred data.

The second and sixth fields of the panel are designated for the names of donor and acceptor cases. A donor case should be in the working directory along with its extension, containing data to be transferred into an acceptor case. An acceptor case also should be in the working directory. Its extension should be there only if new segment data is to be appended to the previously transferred data. To **enter** a file name, select a field and type the name, or **click "OK"** and **select** your file from the working directory.

Enter the system segment descriptors (areas, zones, skip IDs and minimum MWs) the same as was used running *CMPdataBuilder.p*.

Click "OK" and wait until the program completes all insertions and displays all the inconsistencies on the screen and in the *mismatch.log* file.
Review the inconsistencies, **make** corresponding corrections in the CMPLDW table and **run** *CMPdataBuilder.p* to accommodate these corrections in the dyd records.

7. Adding CMPLDW records to a WECC Master Dynamic File (MDF)

Providing CMPLDW data for the entire WECC system may involve joint efforts of the majority of the regions to properly count specific views on feeder and transformer design, voltage control arrangements, performance requirements, load composition, etc. Having an original base case, each region can develop a part of the CMPLDW records independently and send this part to the Process Coordinator (Coordinator) for combining together and adding to the MDF. However, Coordinator should have a more active role in CMPLDW addition development. Coordinator functions may include confirmation of the default assumptions, reviewing the WECC-wide expanded cases, revealing and removing violations. The entire process of adding the CMPLDW records to MDF could be described by the following steps:

1. Coordinator identifies a *case.sav* file for dynamic stability simulations and the corresponding MDF. The CMPLDW records, complementing MDF, could be different for cases, representing different season, hours, weather conditions, etc.

2. Coordinator makes the *case.sav* file available to all regions. The regional engineers (Regions) should rename this case, using new names, specific for their regions (*region.sav*). If Coordinator wants to suggest some default values, they can be listed or provided in the form of *remember_cmpsn*, *remember_fder* and *remember_xfmr* files (see Section 4).

3. Regions define their system segment descriptors (areas, zones, skip IDs, nominal voltages and load MWs to build transformers and feeders) and run *CMPdataBuilder.p*. Running *CMPdataBuilder.p*, Regions modify (if necessary) any of the default values, specified in the *CMPdataBuilder.p* dialog panels. All the defaults will appear in the generated user-defined CMPLDW table and can be replaced by load-specific values after program execution. To accept the corrected set of values, *CMPdataBuilder.p* should be re-executed. If different default values are needed for some sub-segments, the described process should be executed sequentially for each sub-segment.

4. Regions review the obtained CMPLDW, CMPSN and PFLOW tables in the produced *region.exs* extension file; the *region-fder.sav* expanded case with transformers and feeders added; and CMPLDW records in the *region-segm.dyd* file. Some corrections in the CMPLDW table (not in *region.sav*) might be needed if any inappropriate voltages or expanded case divergence are indicated. Run *CMPdataBuilder.p* again after the corrections. Repeat this process as many times as needed.

5. If bus specific load composition data is available this data can be inserted in CMPLDW and CMPSN tables using the *cmpsn_by_bus.p* program.

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6. Regions send the *region.exs* files, containing CMPLDW, CMPSN and PFLOW tables, along with the system segment descriptors (areas, zones, skip IDs) to Coordinator. Sending *region.sav*, *region-fder.sav* and *region-segm.dyd* files is not necessary.

7. Coordinator transfers contents of all *region.exs* files to a single *case.exs* file. To facilitate this process for any regional file (say *PGE.exs*), the following files should be placed in the PSLF working directory:
   - *case.sav* file,
   - all already available regional extension files (say *PGE.exs*, *SCE.exs***,** *BPA.exs*, etc),
   - *PGE.sav* case, parental to *PGE.exs* extension file. The *PGE.sav* file is a duplicate of *case.sav*, renamed to *PGE.sav*.

   The *shareLMData.p* program can be used to develop a blank *case.exs* file and transfer the content of *PGE.exs* file to the *case.exs* file. The *case.sav* and *case.exs* are considered in this transfer as an acceptor pair of files and *PGE.sav* and *PGE.exs* as a donor pair of files. The system segment descriptors for *PGE.exs* should be specified in the *shareLMData.p* dialog panel. No mismatches can be produced by *shareLMData.p* in this process, because all extension files have the same *case.sav* parental base case.

8. Repeating the item (7) process for *SCE.exs, BPA.exs*, etc, Coordinator collects all extension files in the single *case.exs* file. Each repetition should be preceded by renaming the parental case from *PGE.sav* to *SCE.sav* (*SCE.sav* to *BPA.sav*, etc) and using *SCE.sav* and *SCE.exs* (*BPA.sav and BPA.exs*, etc) as a donor pair with the corresponding system segment descriptors.

9. The *CMPdataBuilder.p* program should be executed for the entire WECC system after collecting all regional extensions in one *case.exs* file. This execution will produce *case.exs*, *case-fder.sav* and *case-segm.dyd* files. The last file represents dyd records for the CMPLDW models. All files should be reviewed and all *case-segm.dyd* records should be copied and pasted in the MDF, which becomes ready for running dynamic simulations.