

Joias escondidas no OpenDSS

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2º Encontro do Grupo de Usuários do OpenDSS Brasil
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Visão Geral

- Interpolate coordenadas
- Interpolate XYCurve
- Funções matemáticas do OpenDSS
- Comando Show Lineconstants
- Comando CvrtLoadshapes
- Comando AllowDuplicates
- FormEdit
- Bus Coordinates em Lat-Lon
- Comando NodeDiff
- Comando Vdiff
- Comando Zsc e Zsc10

Interpolate coordenadas

- Precisa de um Energymeter para criar a árvore do circuito

```
New Line.LinhaCD bus1=C.1.2.3 bus2=D.1.2.3 length=0.6 units=km linecode=MeuArranjo3
```

```
// Dados das Cargas
```

```
// Model=1 -> Potencia Constante
```

```
New Load.CargaC phases=1 bus1=C.1.4 kv=7.9674 kw=500 pf=0.92 model=1
```

```
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1
```

```
// Medidor
```

```
New EnergyMeter.MedidorSub element=Transformer.Trafo terminal=1
```

```
// Definindo Tensoes de base
```

```
Set voltagebases=[138 13.8]
```

```
Calc voltagebases
```

```
// SnapShot Mode
```

```
Set mode=SnapShot
```

```
Solve
```

```
// Coordenadas
```

```
BusCoords Coords-Sem-B.csv
```

```
interpolate
```

```
// Arquivos de Resultados
```

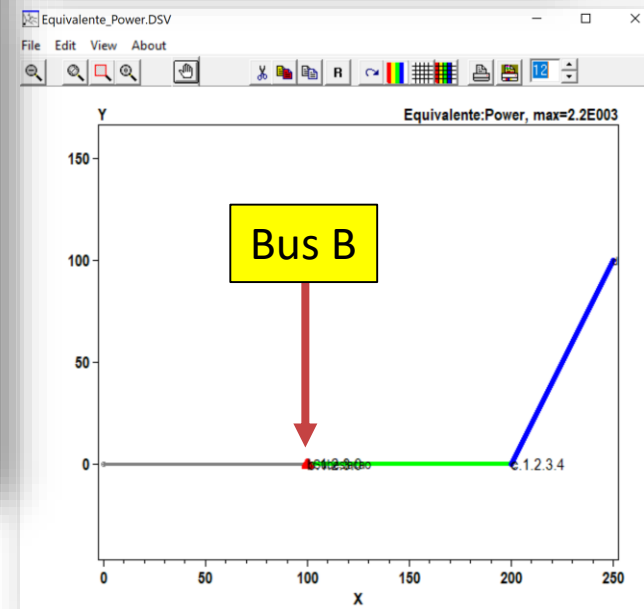
```
Show Voltage LN Nodes
```

```
Show Power Elements
```

```
Show Currents Elements
```

```
Show Losses
```

	A	B	C
A		0	0
C		200	0
D		250	100



Interpolate XYCurve

Source/Fault Vsource 2.574

C:\Users\ppra005\Box\Documents_PC\Brazil_Meetings\OpenDSS_meeting\Presentation

Results for Actor ID # 1
CPU selected : 0
Status = NOT Solved
Solution Mode = Snap
Number = 100
Load Mult = 1.000
Devices = 1
Buses = 0
Nodes = 0
Control Mode =STATIC
Total Iterations = 0
Control Iterations = 0
Max Sol Iter = 0

- Circuit Summary -

```
// -----//  
// Autor: Paulo Radatz  
// e-mail: paulo.radatz@epri.com  
// -----//  
  
// Reinicia o Programa  
Clear  
  
// Dados de Fronteira  
New Circuit.Equivalente bus1=A pu=1.02 basekv=138  
~ Z0=[0.025862916, 0.077588748] Z1=[0.023094242, 0.092376969]  
  
New XYCurve.MyCurve npts=5 Xarray=[1 2 3 4 5] Yarray=[10 5 3 2 1]  
  
XYCurve.MyCurve.x=3.426  
? XYCurve.MyCurve.y
```

Comandos

COM Interface

Object Browser

OpenDSSEngine

Classes

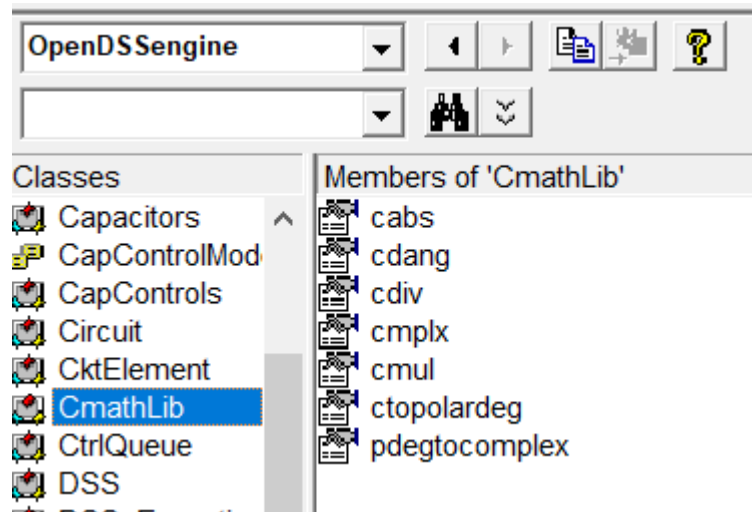
- Parser
- PDElements
- PVSystems
- Reclosers
- ReduceCkt
- RegControls
- Relays
- Sensors
- Settings
- Solution
- SolveModes
- SwtControls
- Text
- Topology
- Transformers
- Vsources
- XYCurves

Members of 'XYCurves'

- Count
- First
- Name
- Next
- Npts
- x
- Xarray
- Xscale
- Xshift
- y
- Yarray
- Yscale
- Yshift

Funções matemáticas do OpenDSS

- Essas funções são úteis quando a linguagem de programação utilizada não tem suporte para números complexos



Set DSSCmath = DSSObj.CmathLib

Comando Show Lineconstants

- Esse comando calcula as impedâncias para todos os objetos LineGeometry definidos

```
// -----//  
// Example from Kersting's Book - Kron Reduction  
// -----//  
  
New Wiredata.Phase GMR=0.0244 DIAM=0.721 RAC=0.306  
~ NormAmps=530  
~ Runits=mi radunits=in gmrunits=ft  
  
New Wiredata.Neutral GMR=0.00814 DIAM=0.563 RAC=0.592  
~ NormAmps=340  
~ Runits=mi radunits=in gmrunits=ft  
  
New Linegeometry.PoleExample nconds=4 nphases=3 reduce=Yes  
~ cond=1 Wire=Phase x= -4 h=29 units=ft  
~ cond=2 Wire=Phase x= -1.5 h=29 units=ft  
~ cond=3 Wire=Phase x= 3 h=29 units=ft  
~ cond=4 Wire=Neutral x= 0 h=25 units=ft  
  
New Line.LineExample bus1=K bus2=L  
~ Geometry=PoleExample  
~ Length=1 units=mi  
~ EarthModel=Carson  
  
Show LineConstants 60 km 100.0
```

Comando

LineConstantsCode.DSS - Notepad

File Edit Format View Help

```
!--- OpenDSS Linecodes file generated from Show LINECONSTANTS command  
!--- Frequency = 60 Hz, Earth resistivity = 100 ohm-m  
!--- Earth Model = Deri
```

```
New Linecode.poleexample nphases=3 Units=km
```

```
~ Rmatrix=[0.280704 | 0.0963664 0.286298 | 0.0948461 0.0976331 0.283121 ]  
~ Xmatrix=[0.671384 | 0.313128 0.65259 | 0.240654 0.264594 0.663218 ]  
~ Cmatrix=[9.35361 | -3.02853 9.85871 | -1.16006 -1.92802 8.89163 ]
```

Geometry Code = poleexample

```
R MATRIX, ohms per km  
0.280704,  
0.0963664, 0.286298,  
0.0948461, 0.0976331, 0.283121, |
```

```
jX MATRIX, ohms per km  
0.671384,  
0.313128, 0.65259,  
0.240654, 0.264594, 0.663218,
```

```
Susceptance (jB) MATRIX, S per km  
3.52623E-006,  
-1.14173E-006, 3.71665E-006,  
-4.37331E-007, -7.26846E-007, 3.35207E-006,
```

```
L MATRIX, mH per km  
1.7809,  
0.830599, 1.73105,  
0.638355, 0.701857, 1.75924,
```

```
C MATRIX, nF per km  
9.35361,  
-3.02853, 9.85871,  
-1.16006, -1.92802, 8.89163,
```

-----Equiv Symmetrical Component -----

```
Z1, ohms per km = 0.187093 + j 0.389605 (L1 = 1.03346 mH)  
Z0, ohms per km = 0.475938 + j 1.20798 (L0 = 3.20427 mH)
```

```
C1, nF per km = 11.4069  
C0, nF per km = 5.29025
```

```
Surge Impedance:  
Positive sequence = 300.998 ohms  
Zero sequence = 778.263 ohms  
Common Mode = 259.253 ohms
```

```
Propagation Velocity (Percent of speed of light):  
Positive sequence = 97.1515  
Zero sequence = 81.0171
```

Comando CvrLoadshapes

```
New Line.LinhaDC bus1=D.1.2.3 bus2=D.1.2.3.4 length=0.6 units=km linecode=MeuArranjo4
New Line.LinhaCD bus1=C.1.2.3 bus2=D.1.2.3 length=0.6 units=km linecode=MeuArranjo3

// Dados das Curvas de Carga
New Loadshape.industrial npts=24 interval=1
~ mult=[0.1 0.1 0.2 0.3 0.3 0.4 0.6 1.2 1.8 1.8 1.9 1.9 1.4 1.6 1.8 1.7 1.7 1.1 0.8 0.6 0.5 0.4 0.2 0.2]
New Loadshape.residencial npts=24 interval=1
~ mult=[0.6 0.5 0.4 0.4 0.5 0.8 1.0 0.8 0.8 0.9 1.0 1.0 1.1 0.9 0.9 0.9 1.0 1.2 1.5 1.5 1.7 1.5 1.2 0.8]

// Dados das Cargas
// Model=1 -> Potencia Constante
New Load.CargaC phases=1 bus1=C.1.4 kv=7.9674 kw=500 pf=0.92 model=1 daily=residencial
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1 daily=industrial

cvrloadshapes type=sng
!cvrloadshapes type=dbl
```

Comando

ReloadLoadshapes.DSS - Notepad

File Edit Format View Help

```
New Loadshape.default Npts=24 Interval=1 mult=[sngfile=default_P.sng]
New Loadshape.industrial Npts=24 Interval=1 mult=[sngfile=industrial_P.sng]
New Loadshape.residencial Npts=24 Interval=1 mult=[sngfile=residencial_P.sng]
```

Carrega mais rápido em memória

Comando AllowDuplicates

- Permite nomes duplicados para o mesmo objeto

```
// Dados dos Trechos
New Line.LinhaBC bus1=B.1.2.3.0 bus2=C.1.2.3.4 length=0.8 units=km
New Line.LinhaCD bus1=C.1.2.3 bus2=D.1.2.3 length=0.6 units=km

Set allowduplicates=Yes

// Dados das Cargas
// Model=1 -> Potencia Constante
New Load.CargaD phases=1 bus1=C.1 kv=7.9671 kw=500 pf=0.92 model=1
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1

// Medidor
New EnergyMeter.MedidorSub element=Transformer.Trafo

// Definindo Tensoes de base
Set voltagebases=[138 13.8]
Calc voltagebases

// SnapShot Mode
Set mode=SnapShot
Solve
```

Comando

Equivalente_Power_elem_kVA.txt - Notepad

File Edit Format View Help

Power Conversion Elements

	Bus	Phase	kW	+j	kvar	kVA	PF
ELEMENT = "Load.CARGAD"							
C	1		500.0	+j	212.9	543.5	0.9200
C	0		0.0	+j	0.0	0.0	1.0000
TERMINAL TOTAL			500.0	+j	212.9	543.5	0.9200

ELEMENT = "Load.CARGAD"							
D	1		666.7	+j	283.9	724.6	0.9200
D	2		666.7	+j	284.0	724.6	0.9200
D	3		666.7	+j	284.0	724.6	0.9200
D	0		0.0	+j	0.0	0.0	1.0000
TERMINAL TOTAL			2000.0	+j	851.9	2173.9	0.9200

Total Circuit Losses = 7.6 +j 202.8

FormEdit

PDelements Line Base Frequency = 60 Hz

nts_PC\Brazil_Meetings\OpenDSS_meeting\Presentation

```
// -----//
// Autor: Paulo Radatz
// e-mail: paulo.radatz@epri.com
// -----//

// Reinicia o Programa
Clear

// Dados de Fronteira
New Circuit.Equivalente bus1=A pu=1.02 basekv=138
~ Z0=[0.025862916, 0.077588748] Z1=[0.025094242, 0.092376969]

// Dados do Transformador
New Transformer.Trafo phases=3 windings=2 %loadloss=0.15 xhl=5 %noloadloss=0.015 %imag=2
~ wdg=1 bus=A kv=138 kva=3000 conn=delta
~ wdg=2 bus=B kv=13.8 kva=3000 conn=wye
~ sub=Yes subname=Subestacao

// Dados dos Trechos
New Line.LinhaBC bus1=B.1.2.3.0 bus2=C.1.2.3.4 length=0.8 units=km
New Line.LinhaCD bus1=C.1.2.3 bus2=D.1.2.3 length=0.6 units=km

// Dados das Cargas
// Model=1 -> Potencia Constante
New Load.CargaC phases=1 bus1=C.1 kv=7.9674 kw=500 pf=0.92 model=1
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1

formedit Line.LinhaBC
```

LINE.LINHABC

Close Update

Property	Value
bus1	b.1.2.3.0
bus2	c.1.2.3.4
linecode	
length	0.8
phases	3
r1	0.058
x1	0.1206
r0	0.1784
x0	0.4047
C1	3.4
C0	1.6
rmatrix	[0.09813333 0.04013333 0.09813333 0.04013333]
ymatrix	[0.2153 0.0947 0.2153 0.0947 0.0947 0.2153]
cmatrix	[2.8 -0.6 2.8 -0.6 -0.6 2.8]
Switch	False
Rg	0.01805
Xg	0.155081
rho	100
geometry	
units	km
spacing	
wires	
EarthModel	Deri
cncables	
tscables	
B1	1.28177
B0	0.6031858
Seasons	1
Ratings	[400.]
normamps	400
emergamps	600
faultrate	0.1
pctperm	20
repair	3
basefreq	60
enabled	true

Bus Coordinates em Lat-Lon

```
New Line.LinhaCD bus1=C.1.2.3 bus2=D.1.2.3 length=0.6 units=km

// Dados das Cargas
// Model=1 -> Potencia Constante
New Load.CargaC phases=1 bus1=C.1 kv=7.9674 kw=500 pf=0.92 model=1
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1

// Medidor
New EnergyMeter.MedidorSub element=Transformer.Trafo terminal=1

// Definindo Tensoes de base
Set voltagebases=[138 13.8]
Calc voltagebases

// SnapShot Mode
Set mode=SnapShot
Solve

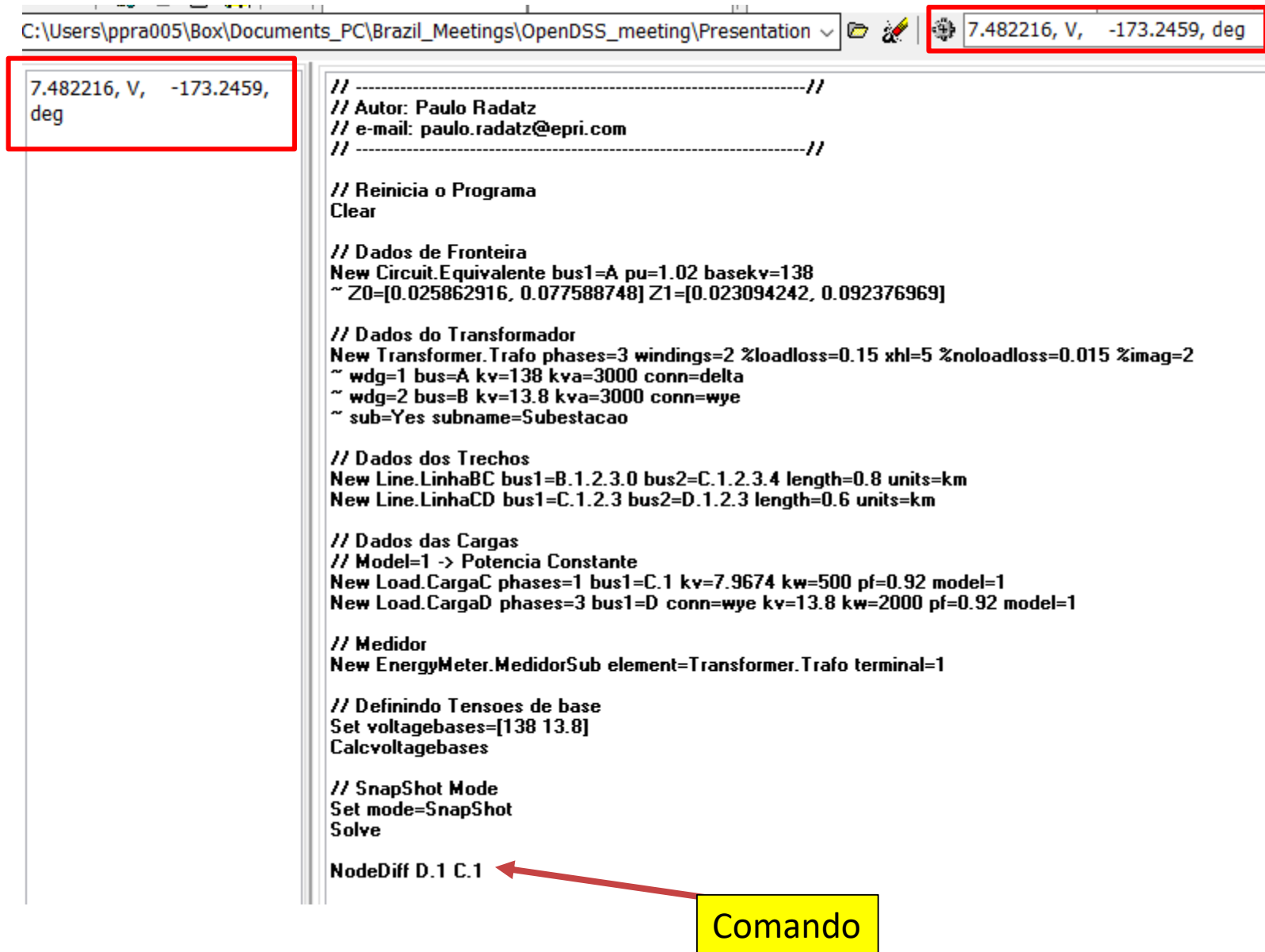
// Coordenadas
LatLongCoords Coords.csv

// Plot o Circuito
Plot circuit Power Max=2200 dots=y labels=y subs=y C1=Blue
```



Comando

Comando NodeDiff



```
C:\Users\ppra005\Box\Documents_PC\Brazil_Meetings\OpenDSS_meeting\Presentation 7.482216, V, -173.2459, deg

7.482216, V, -173.2459, deg

// -----//
// Autor: Paulo Radatz
// e-mail: paulo.radatz@epri.com
// -----//

// Reinicia o Programa
Clear

// Dados de Fronteira
New Circuit.Equivalente bus1=A pu=1.02 basekv=138
~ Z0=[0.025862916, 0.077588748] Z1=[0.023094242, 0.092376969]

// Dados do Transformador
New Transformer.Trafo phases=3 windings=2 %loadloss=0.15 xhl=5 %noloadloss=0.015 %imag=2
~ wdg=1 bus=A kv=138 kva=3000 conn=delta
~ wdg=2 bus=B kv=13.8 kva=3000 conn=wye
~ sub=Yes subname=Subestacao

// Dados dos Trechos
New Line.LinhaBC bus1=B.1.2.3.0 bus2=C.1.2.3.4 length=0.8 units=km
New Line.LinhaCD bus1=C.1.2.3 bus2=D.1.2.3 length=0.6 units=km

// Dados das Cargas
// Model=1 -> Potencia Constante
New Load.CargaC phases=1 bus1=C.1 kv=7.9674 kw=500 pf=0.92 model=1
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1

// Medidor
New EnergyMeter.MedidorSub element=Transformer.Trafo terminal=1

// Definindo Tensoes de base
Set voltagebases=[138 13.8]
Calc voltagebases

// SnapShot Mode
Set mode=SnapShot
Solve

NodeDiff D.1 C.1
```

Comando

Comando Vdiff

```
Wug-2 bus=D kv=13.8 kva=5000 conn=wye
~ sub=Yes subname=Subestacao

// Dados dos Trechos
New Line.LinhaBC bus1=B.1.2.3.0 bus2=C.1.2.3.4 length=0.8 units=km
New Line.LinhaCD bus1=C.1.2.3 bus2=D.1.2.3 length=0.6 units=km

// Dados das Cargas
// Model=1 -> Potencia Constante
New Load.CargaC phases=1 bus1=C.1 kv=7.9674 kw=500 pf=0.92 model=1
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1


// Medidor
New EnergyMeter.MedidorSub element=Transformer.Trafo terminal=1

// Definindo Tensoes de base
Set voltagebases=[138 13.8]
Calc voltagebases

// SnapShot Mode
Set mode=SnapShot

Solve
Save voltages

set loadmult=0.5
solve
Vdiff
```

 Equivalente_VDIFF.txt - Notepad

File Edit Format View Help

a.1,	0.00,	%
a.2,	0.00,	%
a.3,	0.00,	%
b.1,	1.52,	%
b.2,	0.81,	%
b.3,	0.80,	%
c.1,	1.64,	%
c.2,	0.82,	%
c.3,	0.86,	%
d.1,	1.68,	%
d.2,	0.85,	%
d.3,	0.89,	%

Comando Zsc e Zsc10

```
// Model=1 -> Potencia Constante  
New Load.CargaC phases=1 bus1=C.1 kv=7.9674 kw=500 pf=0.92 model=1  
New Load.CargaD phases=3 bus1=D conn=wye kv=13.8 kw=2000 pf=0.92 model=1
```

```
// Medidor  
New EnergyMeter.MedidorSub element=Transformer.Trafo terminal=1
```

```
// Definindo Tensões de base  
Set voltagebases=[138 13.8]  
Calc voltagebases
```

Solve

set Bus=D
ZscRefresh

! Um por vez
Zsc

Zsc10

0.42221, 3.3475, 0.064019,
0.12136, 0.064019,
0.12136, 0.064019,
0.12136, 0.34693, 3.399,
0.062877, 0.12315,
0.064019, 0.12136,
0.062877, 0.12315,
0.34693, 3.399,

Z1, 0.30838, 3.2599,
Z0, 0.4993, 3.6257,

Together...Shaping the Future of Electricity