

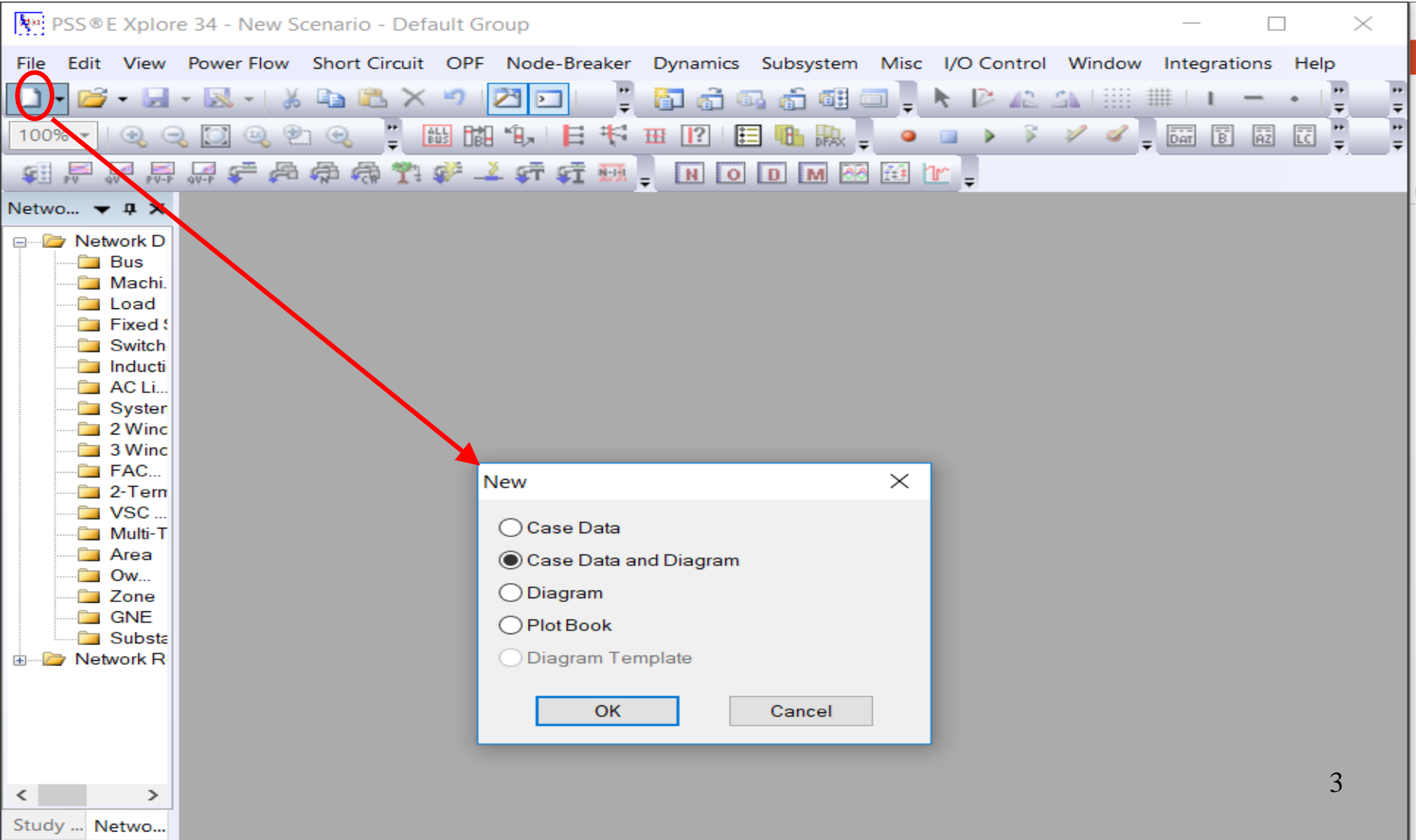
# Introducción al PSS/E

Flujos de carga y simulaciones dinámicas

# Estructura de Archivos

- Archivos:
  - \*.sav
    - Archivo binario con modelo del sistema y solución del flujo de carga guardado
  - \*.sld
    - Archivo binario con el esquema unifilar asociado a un archivo \*.sav
  - \*.dyr
    - Archivo de texto con información para los modelos dinámicos
  - \*.outx
    - Archivo con canales de salida de corrida dinámica
- **IMPORTANTE**
  - Archivo sav y slider se **guardan por separado.**

# Crear un caso nuevo



# Crear un caso nuevo

Build New Case ✕

Base MVA	Base Frequency	Units for tranformer ratings	Units for ratings of non-tranformer branches
<input type="text" value="100.00"/>	<input type="text" value="50"/>	<input type="text" value="MVA"/> ▾	<input type="text" value="Current expressed as MVA"/> ▾
Heading line 1	<input type="text" value="ESEP - Ejercicio Máquina Sincrónica"/>		
Heading line 2	<input type="text"/>		

# Crear un Caso nuevo

Network data

Bus Number	Section Number	Substation Number	Bus Name	Base kV	Area Num	Area Name	Zone Num	Zone Name	Owner Num	Owner Name	Code	Voltage (pu)	Angle (deg)	Normal Vmax (pu)	Normal Vmin (pu)
*															

Bus Plant Machine Load Fixed Shunt Switched Shunt Induction Machine NCSFCC /  
Buses and Equipment Branch Node-Breaker Other /

New Diagram

Diagrama unifilar - \*.sld (Slider)

Planilla de datos - \*.sav

Command Line Input

PSS®E Response

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Select an object on which to get Help

Solution not attempted

-4.62, 1.42

Bind items

Output Bar

# Modelo estático de la red

The image shows the PSS®E Xplore 34 software interface. A red box highlights the top toolbar, and a larger red box highlights a specific section of the toolbar. Red arrows point from icons in this section to labels in boxes at the bottom of the screen. The labels are: Barras, Líneas, Cargas, Generadores, Compensación de reactiva, and Transformadores. The software interface includes a menu bar (File, Edit, View, Diagram, Power Flow, Short Circuit, QPF, Node-Breaker, Dynamics, Subsystem, Misc, I/O Control, Window, Integrations, Help), a toolbar with various icons, a left-hand tree view for the network structure, a main workspace for the network diagram, an output bar with text like "INITIATED ON MON, MAR 26 2018 23:48" and "New study initialized:", and a command line input at the bottom.

**Barras**

**Líneas**

**Cargas**

**Generadores**

**Compensación de reactiva**

**Transformadores**

# Modelar la red: Ejemplo

PSS®E Xplore 34 - New Scenario - Default Group - E:\FACULTAD\Redes\Teórico\Transparencias\ejemplo.sav

File Edit View Data Grid Power Flow Short Circuit QPF Node-Breaker Dynamics Subsystem Misc I/O Control Window Integrations Help

100%

Study Explorer

- Discovered Files
  - ejemplo.sav
  - Ejemplo.sld
- New Study
  - Default Group

Network data

Bus Number	Section Number	Substation Number	Bus Name	Base kV	Area Num	Area Name	Zone Num	Zone Name	Owner Num	Owner Name	Code	Voltage (pu)	Angle (deg)	Normal Vmax (pu)	Normal Vmin (pu)	Emergency Vmax (pu)	Emergency Vmin (pu)
1			BUS_GEN	15.0	1		1		1		3	1.0000	0.00	1.1000	0.9000	1.1000	0.9000
101			BUS_ALTA	15.0	1		1		1		1	1.0000	0.00	1.1000	0.9000	1.1000	0.9000
201			BUS_BAJA	6.0	1		1		1		1	1.0000	-0.00	1.1000	0.9000	1.1000	0.9000

Bus Plant Machine Load Fixed Shunt Switched Shunt Induction Machine NCSFCC /

Buses and Equipment Branch Node-Breaker Other /

Ejemplo.sld

Study Explorer Network Tree

Output Bar

Working case restored to state prior to ISOLATE actions

Progress Alerts/Warnings /

Command Line Input

PSS®E Response

Select an object on which to get Help

Met convergence tolerances Powerflow results MW/Mvar flow Layer - 1 (Foreground) -1.58, 1.67 Bind items Next bus - 1

# Modelar la red: Ejemplo

- Los cuadros de datos a continuación se muestran al hacer doble clic sobre el componente dibujado en el diagrama Slider



# Bus (barra)

Bus Data Record

Power Flow

Basic Data

Bus Number	Bus Name
1	BUS_GEN
Type Code	Base kV
3 - Swing Bus	15.0
Voltage (pu)	Angle (deg)
1.0000	0.00

Grouping Data

Area	Select...
1	Select...
Owner	Select...
1	Select...
Zone	Select...
1	Select...

Limit Data

Normal Vmax (pu)	Normal Vmin (pu)	Emer Vmax (pu)	Emer Vmin (pu)
1.10	0.90	1.10	0.90

OK Cancel

Resultado del Flujo de Carga, no es una consigna.

## Tipo de Barra

**Non-Gen Bus**: barras sin generación (barras PQ por ej)

**Generator Bus**: Barras PV

**Swing Bus**: Barra Flotante (un caso SAV debe tener por lo menos una)

Bus Data Record

Power Flow

Basic Data

Bus Number	Bus Name
1	BUS_GEN
Type Code	Base kV
3 - Swing Bus	15.0
Angle (deg)	
0.00	

Grouping Data

Area	Select...
1	Select...
Owner	Select...
1	Select...
Zone	Select...
1	Select...

Limit Data

Normal Vmax (pu)	Normal Vmin (pu)	Emer Vmax (pu)	Emer Vmin (pu)
1.10	0.90	1.10	0.90

OK Cancel

# Branch (Línea o cable)

Branch Data Record

Power Flow Short Circuit

Basic Data

From Bus Number: 1 From Bus Name: BUS\_GEN 15.000  In Service

To Bus Number: 101 To Bus Name: BUS\_ALTA 15.000  Metered on From end

Branch ID: 1 Branch Name:

Branch Data

Line R (pu): 0.000000	Line X (pu): 0.000100
Charging B (pu): 0.000000	Length: 0.000
Line G From (pu): 0.000000	Line B From (pu): 0.000000
Line G To (pu): 0.000000	Line B To (pu): 0.000000

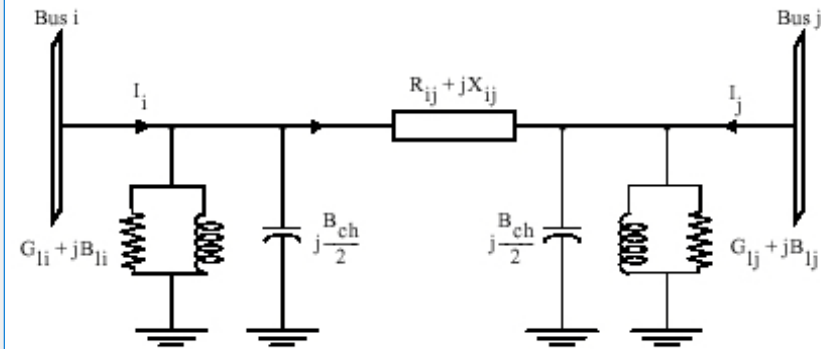
Ratings (I as MVA)

RATE1	0.0
RATE2	0.0
RATE3	0.0
RATE4	0.0
RATE5	0.0
RATE6	0.0

Owner Data

Owner	Fraction
1	1.000
0	1.000
0	1.000
0	1.000

OK Cancel



- Suceptancia B: se ingresa B, luego PSSE divide entre 2 para construir el modelo.

# Modelar la red: Transformer

Two Winding Transformer Data Record

Power Flow Short Circuit

Line Data

From Bus Number: 101 From Bus Name: BUS\_ALTA 15.000  In Service

To Bus Number: 201 To Bus Name: BUS\_BAJA 6.0000  Metered on From end

Branch ID: 1 Transformer Name:   Winding 1 on From end

Vector Group:

I/O Data

Winding I/O Code: 1 - Turns ratio (pu on bus base kV)

Impedance I/O Code: 1 - Z pu (winding kV system MVA)

Admittance I/O Code: 1 - Y pu (system base)

Transformer Impedance Data

Specified R (pu): 0.000000 Specified X (pu): 0.000100

Magnetizing G (pu): 0.00000 Magnetizing B (pu): 0.00000

Impedance Table: 0

R table corrected (pu): 0.00000 X table corrected (pu): 0.00010

Owner Data

Owner: 1 Fraction: 1.000

0 Fraction: 1.000

0 Fraction: 1.000

0 Fraction: 1.000

Transformer Nominal Ratings Data

Winding 1 Ratio (pu): 1.0000 Winding 1 Nominal kV: 0.0000 Ratings (I as MVA): RATE1 0.0, RATE2 0.0, RATE3 0.0, RATE4 0.0, RATE5

Winding 2 Ratio (pu): 1.0000 Winding 2 Nominal kV: 0.0000

Winding (1-2) Angle (degrees): 0.00 Winding MVA: 100.0000

Control Data

Controlled Bus Number: 0 Controlled Bus Name:  Control Mode: 0- None

Controlled Bus On Winding Side  Auto Adjust

Tap Positions: 33 Wnd Connect Angle: 0.00000

R1max (pu): 1.10000 R1min (pu): 0.90000

Vmax (pu): 1.10000 Vmin (pu): 0.90000

Load Drop Comp R (pu): 0.00000

Load Drop Comp X (pu): 0.00000

OK Cancel

- Modo de entrada con la que se quiere ingresar la tensión nominal del TAP
- Tensión nominal del TAP del transformador expresado en pu
  - $\frac{Wind\ 1\ Ratio}{Wind\ 2\ Ratio} = rel\ de\ transf\ en\ pu$
- Modo de ingreso de la impedancia de cortocircuito
- Impedancia de cortocircuito en pu

# Modelar la red: Machine

Machine Data Record

Power Flow | Short Circuit

Basic Data

Bus Number: 1 Bus Name: BUS\_GEN 15.000

Machine ID: 1 In Service:  Bus Type Code: 3

Machine Data

Pgen (MW): 3.0000	Pmax (MW): 9999.0000	Pmin (MW): -9999.0000
Qgen (Mvar): 1.0000	Qmax (Mvar): 9999.0000	Qmin (Mvar): -9999.0000
Mbase (MVA): 100.00	R Source (pu): 0.000000	X Source (pu): 1.000000

Transformer Data

R Tran (pu): 0.00000
X Tran (pu): 0.00000
Gentap (pu): 1.00000

Owner Data

Owner	Fraction
1	1.000
0	1.000
0	1.000
0	1.000

Wind Data

Control Mode: 0 - Not a wind machine

Power Factor (WPF): 1.000

Plant Data

Sched Voltage: 1.0000	Remote Bus: 0
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OK Cancel

- Consigna de potencia activa

## ZSOURCE

- Para simulación dinámica:
  - unsaturated subtransient impedance
  - unsaturated transient impedance
- Para estudios de cortocircuito:
  - saturated subtransient or transient impedance

- Consigna de tensión

# Load

Load Data Record

Power Flow Short Circuit

Basic Data

Bus Number: 201 Bus Name: BUS\_BAJA 6.0000

Load ID: [i]  In Service  Scalable  Interruptible

Load Data

Pload (MW)	Qload (Mvar)
3.0000	1.0000
Iload (MW)	Qload (Mvar)
0.0000	0.0000
YPload (MW)	YQload (Mvar)
0.0000	0.0000

Distributed generation on feeder

Distributed gen (MW): 0.0000 Distributed gen (Mvar): 0.0000

Grouping Data

Area: 1 Select...  
Owner: 1 Select...  
Zone: 1 Select...

OK Cancel

- P y Q constantes con la tensión
  - Si V de la barra > PQBRAK
  - PQBRAK variable de ajuste bajo “Power Flow/Solution/Parameters”
- P y Q como corriente constante
- P y Q como impedancia constante

# Modelar la red: Fixed Shunt

Fixed Shunt Data Record

Power Flow Short Circuit

**Basic Data**

Bus Number: 201

Bus Name: BUS\_BAJA 6.0000

Fixed Shunt ID: 1

In Service

**Fixed Shunt Data**

G-Shunt (MW): 0.00

B-Shunt (Mvar): 0.00

OK Cancel

# Modelar la red: Switched Shunt

Switched Shunt Data Record

Power Flow Short Circuit

Basic Data

Bus Number	201	Bus Name	BUS_BAJA 6.0000
Remote Bus	1	Remote Bus Name	

In Service

VSC Name: None

Control Mode: 1 - Discrete, cntr voltage

Adjustment Method: 0 - Sequential input order

Switched Shunt Data

Vhi (pu)	1.0000	Vlo (pu)	1.0000
Contributed Vars (%)	100.00	Binit (Mvar)	0.00
Block 1 Steps	0	Block 1 Bstep (Mvar)	0.00
Block 2 Steps	0	Block 2 Bstep (Mvar)	0.00
Block 3 Steps	0	Block 3 Bstep (Mvar)	0.00
Block 4 Steps	0	Block 4 Bstep (Mvar)	0.00
Block 5 Steps	0	Block 5 Bstep (Mvar)	0.00
Block 6 Steps	0	Block 6 Bstep (Mvar)	0.00
Block 7 Steps	0	Block 7 Bstep (Mvar)	0.00
Block 8 Steps	0	Block 8 Bstep (Mvar)	0.00

OK Cancel

# Correr un flujo de carga

PSS®E Xplore 34 - New Scenario - Default Group - E:\FACULTAD\Redes\Teórico\Transparencias\ejemplo.sav

File Edit View Diagram Power Flow Short\_Circuit QPF Node-Breaker Dynamics Subsystem Misc I/O Control Window Integrations Help

G-OUT (Generate bus display)... Ctrl+Mayusculas+G

117%

Solution

- Parameters...
- Solve (NSOL/FNSL/FDNS/SOLV/MSLV)... Ctrl+Mayusculas+S
  - Solve with last known solution attempt
  - N-R solution with inertial / governor dispatch (INLF)...
  - Order network for matrix operations (ORDR)...
  - Factorize admittance matrix (FACT)
  - Solution for switching studies (TYSL)...
- Sensitivity analysis...
- Default solution parameters...

Code Voltage (pu)

Code	Voltage (pu)
3	1.1
1	1.1
1	1.1

Study Explorer

- Discovered Files
  - ejemplo.sav
  - Ejemplo.sld
- New Study
  - Default Group

List Data... Ctrl+Mayusculas+L

Check Data

Renumbering Areas / Owners / Zones ...

Renumber Buses

GLC (Geomagnetic Induced Currents)

DVRM (Data Visualization and Reporting Module)...

Ejemplo.sld

Study Explorer Network Tree

Output Bar

Working case restored to state prior to ISOLATE actions

Progress Alerts/Warnings /

Command Line Input

PSS®E Response

Solve

Met convergence tolerances Powerflow

Loadflow solutions

Newton Gauss Robust Solution

Solution method

- Fixed slope decoupled Newton-Raphson
- Full Newton-Raphson
- Decoupled Newton-Raphson

Solution options

Tap adjustment

- Lock taps
- Stepping
- Direct

Switched shunt adjustments

- Lock all
- Enable all
- Enable continuous, disable discrete

Area interchange control

- Disabled
- Tie lines only
- Tie lines and loads

Do not Flat Start

- Non-divergent solution
- Adjust phase shift
- Adjust DC taps

VAR limits

- Apply automatically
- Apply immediately
- Ignore
- Apply at 0 iterations

Show this window when using the Solve toolbar button

Solve Defaults Close



# Chequear convergencia

PSS®E Xplore 34 - New Scenario - Default Group - E:\FACULTAD\Redes\Teórico\Transparencias\ejemplo.sav - [Ejemplo.sld]

File Edit View Diagram Power Flow Short\_Circuit QPF Node-Breaker Dynamics Subsystem Misc I/O Control Window Integrations Help

117%

Study Explorer

- Discovered Files
  - ejemplo.sav
  - Ejemplo.sld
- New Study
  - Default Group

Study Explorer Network Tree

Output Bar

Power flow data changed for non-transformer branch circuit "1" from 1 [BUS\_GEN 15.000] to 101 [BUS\_ALTA 15.000]:

ITER	DELTA P	BUS	DELTA Q	BUS	DELTA/V/	BUS	DELTA ANG	BUS
0.0	0.0000	( 201 )	0.0000	( 201 )				
0.5	0.0000	( 201 )	0.0000	( 201 )	0.00000	( )	0.00000	( 201 )
1.0	0.0000	( 201 )	0.0000	( 201 )	0.00000	( 201 )	0.00000	( )

Reached tolerance in 1 iterations

Largest mismatch: 0.00 MW -0.00 Mvar 0.00 MVA at bus 1 [BUS\_GEN 15.000]  
 System total absolute mismatch: 0.00 MVA

SWING BUS SUMMARY:

BUS#-SCT	X-- NAME	--X BASKV	PGEN	PMAX	PMIN	QGEN	QMAX	QMIN
1	BUS_GEN	15.000	3.0	9999.0	-9999.0	1.0	9999.0	-9999.0

Progress Alerts/Warnings /

Command Line Input

PSS®E Response

Select an object on which to get Help

Met convergence tolerances Powerflow results MW/Mvar flow Layer - 1 (Foreground) -4.62, -1.58 Bind items Next bus - 1

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# Información en el Slider

The screenshot shows the PSS®E Xplore 34 interface. The 'Diagram Properties' dialog box is open, displaying various settings for diagram annotation. The following options are highlighted with red boxes:

- Branch annotation:**  MW/Mvar flow
- Equipment annotation:**  MW/Mvar
- Bus voltage annotation:**  Magnitude (PU),  Magnitude (kV)
- Flow direction:**  Arrows

The background diagram shows a bus labeled '1 BUS\_GEN' with a branch value of '1.0R'. The output bar at the bottom displays the following data:

ITER	DELTAP	BUS	DELTAQ	BUS	DELTA/V/	BUS
0.0	0.0000	( 201 )	0.0000	( 201 )		

The Command Line Input area shows 'PSS®E Response'.

# Ejercicio: Radial Valentines

<b>Barras</b>	<b>Tesión (kV)</b>	<b>P(MW)</b>	<b>Q(MVAr)</b>			
TER150	154.5	-	-			
VAL150	-	7.1	1.4			
TYT150	-	22.7	8.2			
MEL150	-	15.2	4.0			
EMA150	-	5.1	1.7			
<b>Líneas</b>						
<b>BusIni</b>	<b>BusFin</b>	<b>R(ohm)</b>	<b>X(ohm)</b>	<b>B(μmho)</b>	<b>Rate A (A)</b>	<b>Rate B (A)</b>
TER150	VAL150	19.56	58.95	405.5	368	480
VAL150	TYT150	8.51	25.63	176.3	368	480
TYT150	MEL150	14.22	42.84	294.7	120	120
TYT150	EMA150	14.99	25.37	189.1	240	240
<b>Vbase (kV)</b>	150					
<b>Sbase (MVA)</b>	100					