

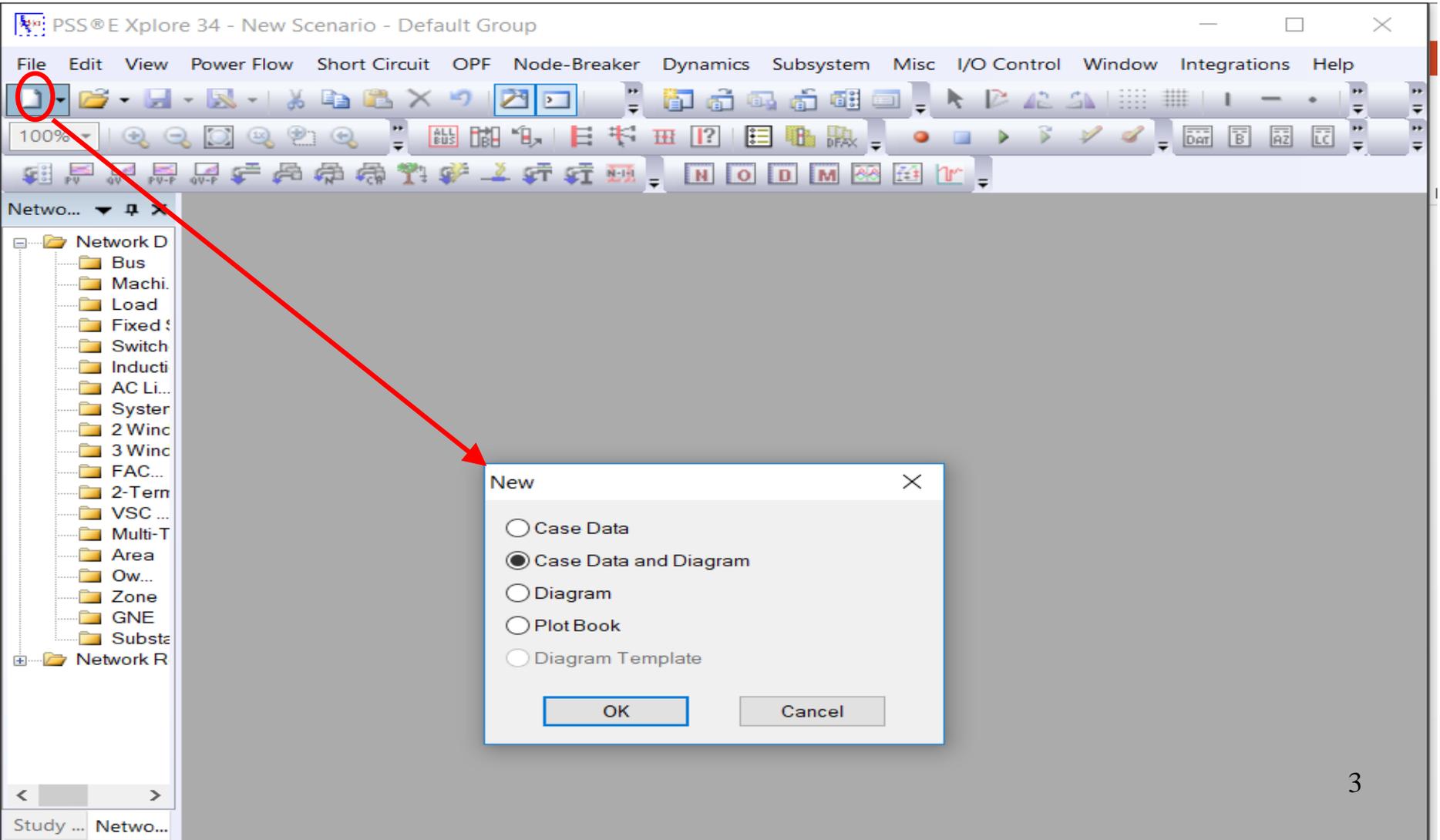
Introducción al PSS/E

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
100.00	50	MVA	Current expressed as MVA

Heading line 1: ESEP - Ejercicio Máquina Síncronica

Heading line 2:

OK Cancel

Crear un Caso nuevo

PSS®E Xplore 34 - New Scenario - Default Group

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

100%

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

Planilla de datos - *.sav

Diagrama unifilar - *.sld (Slider)

Command Line Input

PSS®E Response

5

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. The main window displays a network diagram area. A red box highlights the top toolbar, and a larger red box highlights a specific section of the toolbar. Red arrows point from this section to five labels: 'Barras', 'Líneas', 'Cargas', 'Generadores', and 'Compensación de reactiva'. Another red arrow points from a transformer icon in the toolbar to the label 'Transformadores'. The 'Output Bar' at the bottom shows the text: 'INITIATED ON MON, MAR 26 2018 23:48' and 'New study initialized: ** BASE ERROR: option setting set to 50 0000'. The 'Command Line Input' field at the bottom left contains 'PSS®E Response'. The status bar at the bottom indicates 'Solution not attempted' and '1.42, 0.30 Bind items'.

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:

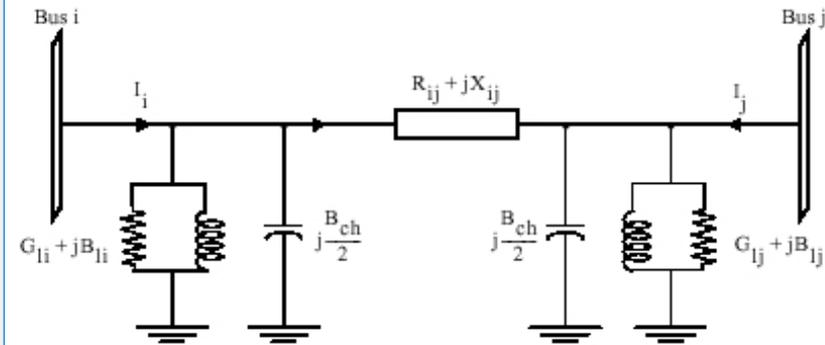
Branch Data

Line R (pu): 0.000000	Line X (pu): 0.000100	Ratings (I as MVA)
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	

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

Owner: 0 Fraction: 1.000

Owner: 0 Fraction: 1.000

Owner: 0 Fraction: 1.000

Transformer Nominal Ratings Data

Winding 1 Ratio (pu): 1.0000 Winding 1 Nominal kV: 0.0000

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

Transformer Data

R Tran (pu)	X Tran (pu)	Gentap (pu)
0.00000	0.00000	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	Remote Bus
1.0000	0

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

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
Topology
Reports
Convert Loads and Generators...
Equivalence Networks...
Linear Network
Contingency, Reliability, PV/QV analysis
List Data... Ctrl+Mayusculas+L
Check Data
Re numbering Areas / Owners / Zones ...
Rename Buses
GIC (Geomagnetic Induced Currents)
DVRM (Data Visualization and Reporting Module)...

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)
3 1.1
1 1.1
1 1.1

1 BUS_GEN 101 BUS_ALTA
3.0 1.0R 3.0 1.0
1.0 15.0 1.0 15.0
-3.0
-1.0

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

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

15

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 'Diagram Annotation' tab is active, showing options for bus, ID, and multisection line annotations. The 'Load Flow Annotation' section is highlighted with a red box, showing 'MW/Mvar flow' selected. The 'Flow direction' section is also highlighted with a red box, showing 'Arrows' selected. The 'Bus voltage annotation' section is highlighted with a red box, showing 'Magnitude (PU)' and 'Magnitude (kV)' selected. The 'Equipment annotation' section shows 'MW/Mvar' selected. The 'Loading basis for % Rating' section shows 'Current engine settings' selected. The 'Transformers' section shows 'Current expressed as MVA' selected. The 'Non-Transformer Branches' section shows 'Current expressed as MVA' selected. The background shows a power system diagram with a bus labeled '1 BUS_GEN' and a branch with a value of '1.0R'. The output bar at the bottom displays power flow data for a non-transformer branch circuit.

Diagram Properties

Diagram Annotation | Diagram Range Checking | Diagram Settings | Advanced Diagram Settings

Bus annotation: Numbers Names

ID annotation: Branch IDs Equipment IDs

Multisection Lines: Show Multisection Lines

Precision: PF results 1 SC results 2 OPF results 1 PU results 1

Load Flow Annotation | Impedance Data Annotation

Branch annotation: MW/Mvar flow MVA Flow MVA/%Rating Amps/PU Current MW/% Rating Amps/% Rating None

Equipment annotation: MW/Mvar MVA MW Mvar None

Bus voltage annotation: Magnitude (PU) Magnitude (kV) Angle (Degrees)

Flow direction: Signs Arrows

Loading basis for % Rating: Current engine settings

Transformers: Current expressed as MVA

Non-Transformer Branches: Current expressed as MVA

Output Bar:

```
Power flow data changed for non-transformer branch circuit "1" from 1 [BUS_GE
X-----ORIGINAL-----X X-----NEW VALUE-----
0 1
ITER DELTAP BUS DELTAQ BUS DELTA/V/ BUS
0.0 0.0000 ( 201 ) 0.0000 ( 201 )
```

Modelo dinámico de Generadores

Table 1: Summary of Generator Models in Terms of Data Used

Reactance and Time Constants Used	Model				
	GENSAL and GENSAE	GENROU and GENROE	GENDCO	GENTRA	GENCLS
X_d	✓	✓	✓	✓	✓
X_q	✓	✓	✓	✓	
X'_d	✓	✓	✓	✓	✓
X'_q		✓	✓		
X''_d	✓	✓	✓		
X''_q	*	*	*		
X_l	✓	✓	✓	✓	
T'_{do}	✓	✓	✓	✓	
T'_{qo}		✓	✓		
T''_{do}	✓	✓	✓	✓	
T''_{qo}	✓	✓	✓	✓	
Saturation Factors	✓	✓	✓	✓	
T_a			✓		

* X''_q is assumed to be equal to X''_d .

Modelo dinámico de Generadores

- GENSAL y GENSAE (Salient Pole Machines)
 - GENSAL curva de saturación con ley cuadrática
 - GENSAE curva de saturación con ley exponencial
 - Reactancia subtransitoria = ZSORCE del flujo de carga
 - Si representan N máquinas idénticas en paralelo
 - Ingresar datos en pu con MVA base de una sola máquina
 - Especificar MBASE en el flujo de carga = $N \times \text{MVA_base_una_máq}$
 - Reducir MBASE en el flujo de carga es como disparar un porcentaje equivalente de máquinas
 - MBASE no debería incrementarse durante la simulación
 - El disparo y reconexión se puede realizar cambiando el código del bus
 - “1” para disparo y “2” para reconexión
 - T''_{d0} y T''_{q0} deberían ser mayores que $4 \cdot \Delta T$ (condiciones iniciales sospechosas)
- GENROU y GENROE (Solid Rotor Machines)
 - Idem GENSAL y GENROE
 - Requiere información adicional: T'_{q0} y x'_{q}

Modelo dinámico de Generadores

1.21 GENSAI

Salient Pole Generator Model (Quadratic Saturation on d-Axis)

This model is located at system bus # _____ IBUS,

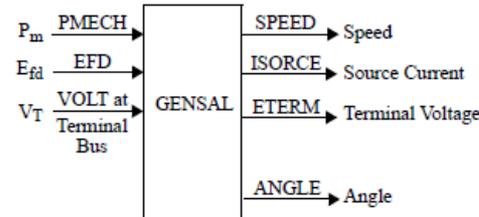
Machine identifier # _____ ID,

This model uses CONs starting with # _____ J,

and STATES starting with # _____ K.

The machine MVA is _____ for each of units = _____ MBASE.

ZSORCE for this machine is _____ + j _____ on the above MBASE.



CONs	#	Value	Description
J			T'_{do} (>0) (sec)
J+1			T''_{do} (>0) (sec)
J+2			T''_{qo} (>0) (sec)
J+3			H, Inertia
J+4			D, Speed damping
J+5			X_d
J+6			X_q
J+7			X'_d
J+8			$X''_d = X''_q$
J+9			X_l
J+10			S(1.0)
J+11			S(1.2)

Note: X_d , X_q , X'_d , X''_d , X''_q , X_l , H, and D are in pu, machine MVA base.

X''_q must be equal to X''_d .

1.19 GENROU

Round Rotor Generator Model (Quadratic Saturation)

This model is located at system bus # _____ IBUS,

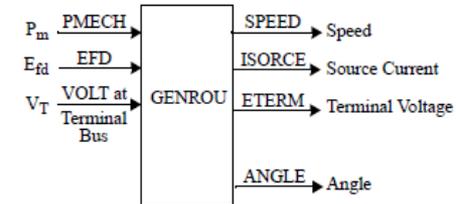
Machine identifier # _____ ID,

This model uses CONs starting with # _____ J,

and STATES starting with # _____ K.

The machine MVA is _____ for each of _____ units = _____ MBASE.

ZSORCE for this machine is _____ + j _____ on the above MBASE



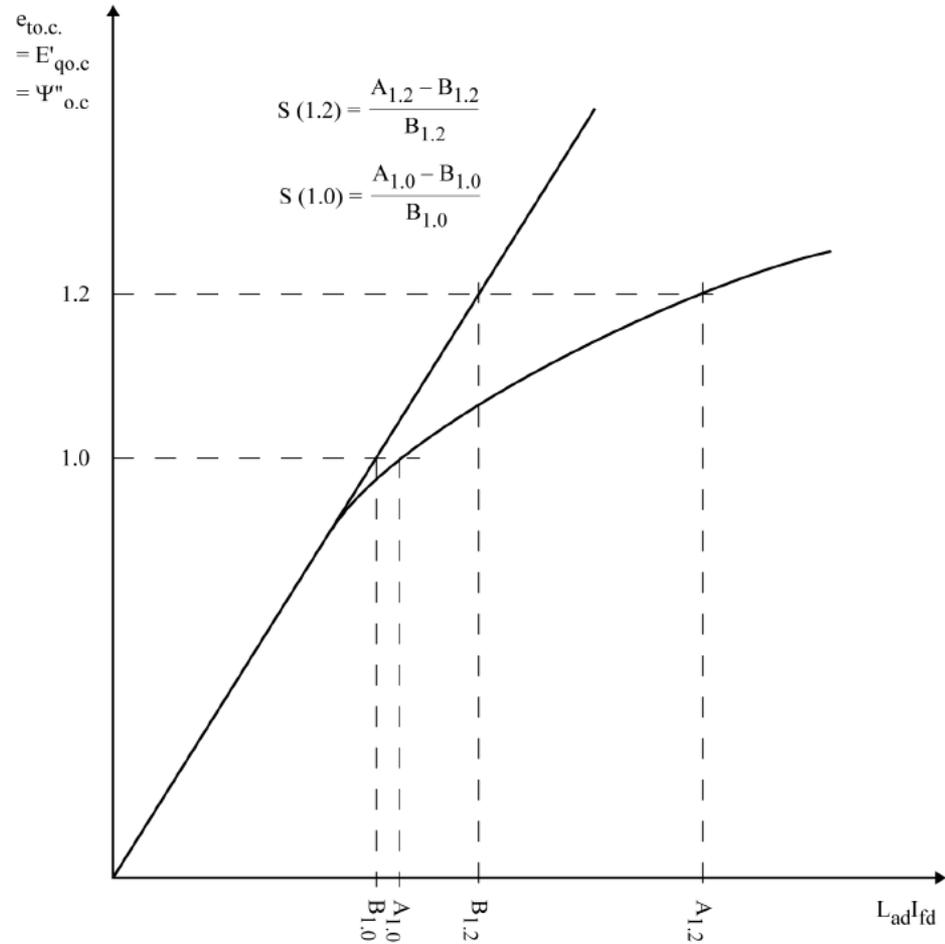
CONs	#	Value	Description
J			T'_{do} (>0) (sec)
J+1			T''_{do} (>0) (sec)
J+2			T'_{qo} (>0) (sec)
J+3			T''_{qo} (>0) (sec)
J+4			H, Inertia
J+5			D, Speed damping
J+6			X_d
J+7			X_q
J+8			X'_d
J+9			X'_q
J+10			$X''_d = X''_q$
J+11			X_l
J+12			S(1.0)
J+13			S(1.2)

Note: X_d , X_q , X'_d , X'_q , X''_d , X''_q , X_l , H, and D are in pu, machine MVA base.

X''_q must be equal to X''_d .

Modelo dinámico de Generadores

Representación de la saturación



DT99_037

Figure 15-6. Definition of Saturation Factor, S, for Entry as Generator Data

Modelo dinámico de Generadores

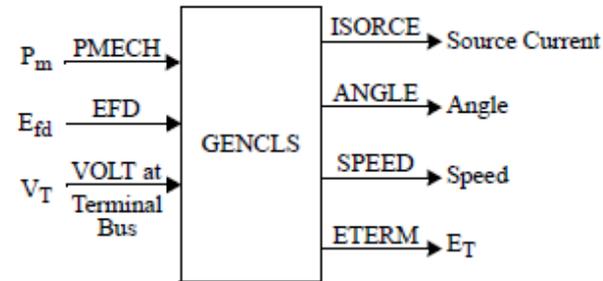
- GENCLS
 - GENCLS is the classical constant voltage behind transient reactance generator model.
 - Setting the type code of the terminal bus to 1, or the generator status flag to zero, removes the unit from service.
 - After being initialized in STRT, EFD(I) for GENCLS models should not be changed during a run.
 - It is not valid to use an excitation system to vary EFD in conjunction with the GENCLS model.

Modelo dinámico de Generadores

1.16 GENCLS

Constant Internal Voltage Generator Model

This model is located at system bus # ___ IBUS,
 Machine identifier # ___ ID,
 This model uses CONs starting with # ___ J,
 and STATEs starting with # ___ K.
 The machine MVA base is ___ for each
 of ___ units = ___ MBASE.
 ZSORCE for this machine is ___ + j
 ___ on the above MBASE.



CONs	#	Value	Description
J			H, Inertia ¹
J+1			D, Damping constant

¹ H and D are in pu machine MVA base.
 If H is 0, then DSTATE(K) and DSTATE(K+1) will always be zero.

STATEs	#	Description
K		Δ speed (pu)
K+1		Angle (radians)

IBUS, 'GENCLS', ID, CON(J) and CON(J+1) /

Modelo dinámico de Generadores

Ejemplo archivo Dyr

```
E:\FACULTAD\ESEP\Clase_PSSE\ej_maq_Parte_1.dyr - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window 2
ej_maq_Parte_1.dyr x ej_maq_Parte_2.dyr x ej_maq_Parte_4.dyr x Parte_1.py x
1 /Maquina 1, GENSAL
2 /IBUS, Modelo , ID, T'd0, T''d0, T''q0, H, D, Xd, Xq, X'd, X''d, Xl, S(1.0), S(1.2)
3 1, 'GENSAL', 'G1', 8.96, 0.05, 0.05, 23.64, 0, 0.146, 0.0969, 0.0608, 0.01, 0.0336, 0, 0
4
5 /Maquina 2, GENROU
6 /IBUS, Modelo , ID, T'd0, T''d0, T''q0, T''q0, H, D, Xd, Xq, X'd, X''q, X''d, Xl, S(1.0), S(1.2)
7 2, 'GENROU', 'G2', 6.00, 0.05, 0.535, 0.04, 6.4, 0, 0.8958, 0.8645, 0.1198, 0.1969, 0.1, 0.0521, 0, 0
8
9 /Maquina 3, GENROU
10 /IBUS, Modelo , ID, T'd0, T''d0, T''q0, T''q0, H, D, Xd, Xq, X'd, X''q, X''d, Xl, S(1.0), S(1.2)
11 3, 'GENROU', 'G3', 5.89, 0.05, 0.6, 0.04, 3.01, 0, 1.3125, 1.2578, 0.1813, 0.25, 0.15, 0.0742, 0, 0
12
Normal text file length: 764 lines: 12 Ln: 11 Col: 23 Sel: 0|0 Windows (CR LF) UTF-8 INS
```

Simulación dinámica

Paso 1: Convert Loads and Generators

The screenshot displays the PSS/E Xplore interface. The 'Power Flow' menu is open, showing the 'Convert Loads and Generators...' option. The 'Convert / Reconstruct Loads and Generators' dialog box is active, showing the following settings:

- Generators:**
 - Convert Generators (Generators are not converted)
 - Machine impedance:**
 - Use ZSORCE
 - Use fault analysis X'
 - Use fault analysis X''
 - Use fault analysis Xs
- Loads:**
 - Convert / Reconstruct Loads
 - Operation:** Convert constant MVA loads
 - Active Power:**
 - % Constant current: 0.000
 - % Constant admittance: 70.000
 - % Constant power: 30.0
 - Reactive Power:**
 - % Constant current: 0.000
 - % Constant admittance: 100.000
 - % Constant power: 0.0
- Select:**
 - All buses
 - Selected bus subsystem (Select...)
 - The following buses ()

Buttons: Convert, Close

Output Bar:
The Saved Case in file E:\FACULTAD\ESEP\Clase_PSS\E\ej_maq_Parte_1...
The following option settings are changed to the settings contain...
** BASE FREQUENCY option setting set to 50.0000

Simulación dinámica

Paso 2: ORDER

The screenshot displays the PSS/E Xplore 34 software interface. The 'Power Flow' menu is open, and the 'ORDER' option is selected. A dialog box titled 'Order Network' is shown, with the option 'Assume all branches are in-service' selected. The background shows a data grid with columns for 'Code', 'Voltage (pu)', 'Angle (deg)', 'Normal Vmax (pu)', 'Normal Vmin (pu)', 'Emergency Vmax (pu)', and 'Emergency Vmin (pu)'. The output bar at the bottom shows the following text:

```
Generator conversion completed using ZSORCE
3 loads converted during this step
3 of 3 loads converted
```

Simulación dinámica

Paso 3: FACT

The screenshot displays the PSS/E Xplore 34 software interface. The 'Power Flow' menu is open, and the 'Factorize admittance matrix (FACT)' option is selected. The background shows a table of bus data and an output window with simulation logs.

Owner name	Code	Voltage (pu)	Angle (deg)	Normal Vmax (pu)	Normal Vmin (pu)	Emergency Vmax (pu)	Emergency Vmin (pu)
	2	1.0400	0.00	1.1000	0.9000	1.1000	0.9000
	2	1.0250	9.28	1.1000	0.9000	1.1000	0.9000
	2	1.0250	4.66	1.1000	0.9000	1.1000	0.9000
	1	1.0258	-2.22	1.1000	0.9000	1.1000	0.9000
	1	0.9956	-3.99	1.1000	0.9000	1.1000	0.9000
	1	1.0127	-3.69	1.1000	0.9000	1.1000	0.9000
	1	1.0258	3.72	1.1000	0.9000	1.1000	0.9000
	1	1.0159	0.73	1.1000	0.9000	1.1000	0.9000
	1	1.0324	1.97	1.1000	0.9000	1.1000	0.9000

Output Bar:

```
** BASE FREQUENCY option setting set to 50.0000
Generator conversion completed using ZSORCE
3 loads converted during this step
3 of 3 loads converted
Diagonals = 9   Off-diagonals = 12   Maximum size = 18
9 diagonal and 12 off-diagonal elements
```

Simulación dinámica

Paso 4: TYSL

The screenshot displays the PSS®E software interface. The 'Solution' menu is open, highlighting 'Solution for switching studies (TYSL)...'. A dialog box titled 'Solution for Switching Studies' is in the foreground, with 'Use voltage vector as start point' selected. The background shows a data table with columns for 'Owner name', 'Code', 'Voltage (pu)', 'Angle (deg)', 'Normal Vmax (pu)', 'Normal Vmin (pu)', 'Emergency Vmax (pu)', and 'Emergency Vmin (pu)'. The output bar at the bottom shows the progress of generator conversion and load conversion.

Owner name	Code	Voltage (pu)	Angle (deg)	Normal Vmax (pu)	Normal Vmin (pu)	Emergency Vmax (pu)	Emergency Vmin (pu)
	2	1.0400	0.00	1.1000	0.9000	1.1000	0.9000
	2	1.0250	9.28	1.1000	0.9000	1.1000	0.9000
	2	1.0250	4.66	1.1000	0.9000	1.1000	0.9000
	1	1.0258	-2.22	1.1000	0.9000	1.1000	0.9000
	1	0.9956	-3.99	1.1000	0.9000	1.1000	0.9000
	1	1.0127	-3.69	1.1000	0.9000	1.1000	0.9000
	1	1.0258	3.72	1.1000	0.9000	1.1000	0.9000
	1	1.0159	0.73	1.1000	0.9000	1.1000	0.9000
	1	1.0324	1.97	1.1000	0.9000	1.1000	0.9000

Generator conversion completed using ZSORCE
3 loads converted during this step
3 of 3 loads converted
Diagonals = 9 Off-diagonals = 12 Maximum size = 18
9 diagonal and 12 off-diagonal elements
9 diagonal and 12 off-diagonal elements

Simulación dinámica

Paso 5: Abrir archivo DYR

The screenshot displays the PSS®E software interface. The main window title is "PSS®E Xplore 34 - New Scenario - Default Group - E:\FACULTAD\ESEP\Clase_PSS\ej_maq_Parte_1.sav - [Network data]". The menu bar includes File, Edit, View, Data Grid, Power Flow, Short Circuit, OPF, Node-Breaker, Dynamics, Subsystem, Misc, I/O Control, Window, Integrations, and Help. The toolbar contains various icons for file operations and simulation. The Plot Tree on the left shows a hierarchy of data files and functions. The main workspace shows a table with columns: Code, Voltage (fu), Angle (deci), Normal Vmax (fu), Normal Vmin (fu), Emergency Vmax (fu), and Emergency Vmin (fu). The table contains two rows of data.

An "Abrir" (Open) dialog box is open, showing the file explorer for the directory "Facultad (E) > FACULTAD > ESEP > Clase_PSS". The file list includes "ej_maq_Parte_1.dyr", "ej_maq_Parte_2.dyr", and "ej_maq_Parte_4.dyr". The file type filter is set to "Dynamics Data file (*.dyr)".

The console window at the bottom displays the following text:

```
9 diagonal and 12 off-diagonal elements
ITER DELTAV/TOL X----- AT BUS -----X REAL (DELTAV) IMAG (DELTAV)
 1  1.005  5  [ 230.00] -0.7397E-05 -0.6798E-05
 2  0.044  5  [ 230.00] -0.3755E-06 -0.2276E-06

Reached tolerance in 2 iterations

Largest mismatch:  -0.00 MW  -0.00 Mvar  0.00 MVA at bus 1 [ 16.500]
System total absolute mismatch:  0.00 MVA
```

Simulación dinámica

Paso 5: Abrir archivo DYR

Read Raw Format Dynamics Data

Input files

- DYRE file: E:\FACULTAD\ESEP\Clase_PSSE\ej_maq_Parte_1.dyr
- CONEC file: [Empty]
- CONET file: [Empty]
- Compile file: [Empty]

Starting indices

- Starting CON: 1
- Starting STATE: 1
- Starting VAR: 1
- Starting ICON: 1

Buttons: OK, Cancel

Background Console Output:

```
ITER DELTAV/IOE X AT BUS X REAL(DELTAIV) IMAG(DELTAIV)
1 1.005 5 [ 230.00] -0.7397E-05 -0.6798E-05
2 0.044 5 [ 230.00] -0.3755E-06 -0.2276E-06

Reached tolerance in 2 iterations

Largest mismatch: -0.00 MW -0.00 Mvar 0.00 MVA at bus 1 [ 16.500]
System total absolute mismatch: 0.00 MVA
```

Background Plot Tree:

- PlotData
 - Channel Files
 - Comtrade Files
 - Functions

Simulación dinámica

Opcional: Set relative machine angles

The screenshot displays the PSS®E Xplore 34 software interface. The main window shows a table of bus data and a table of exciter parameters. A dialog box titled "Dynamic Simulation Options" is open, with the "Simulation" tab selected. The dialog contains various checkboxes and input fields for configuring simulation options. The "Set relative machine angles" checkbox is checked, and the "Relative to machine" radio button is selected. The "Bus (Number)" field is set to "1, 'G1'".

Bus Number	Bus Name	Id
1	16.500	G1
2	18.000	G2
3	13.800	G3

Exciter	In Service	Type	Turbine Governor	In Service	Type	Stabilizer	In Service	Type	Min Exciter	In Service	Type	Max Exciter
ne	<input type="checkbox"/>		None	<input type="checkbox"/>		None	<input type="checkbox"/>		None	<input type="checkbox"/>		None
ne	<input type="checkbox"/>		None	<input type="checkbox"/>		None	<input type="checkbox"/>		None	<input type="checkbox"/>		None

Dynamic Simulation Options

Range and Thresholds | Voltage Violation | Simulation

- Network frequency dependence
- Scan circuits against generic relay zones
 - Scan active subsystem only
- Scan out-of-step conditions
 - Scan active subsystem only
 - Monitor only Monitor and trip
- Scan generators exceeding angle threshold
 - Scan active subsystem only
 - 180.00 Degrees
 - 0.00 MBASE threshold (MVA)
 - Monitor only Monitor and trip
- Scan generators exceeding speed deviation threshold
 - Scan active subsystem only
 - 1.50 Voltage max. (pu)
 - 0.50 Voltage min. (pu)
 - Monitor only Monitor and trip
- Scan generators exceeding power unbalance threshold
 - 1.10 Threshold (pu)
- Set relative machine angles
 - Relative to machine
 - Bus (Number): 1, 'G1'
 - Relative to system average angle
 - Relative to system weighted average angle

OK Cancel

Simulación dinámica

Paso 6: Definir canales

The screenshot shows the PSS/E software interface. The 'Dynamics' menu is open, and the 'Define simulation output (CHAN)' option is selected. A dialog box titled 'Assign Channels for Machine Quantities' is displayed in the foreground. The dialog box contains the following fields and options:

- Select machine:** A text box containing '1, 'G1'' and a 'Select...' button.
- Machine quantity:** A dropdown menu set to 'Angle'.
- Output channel:** A spinner box set to '1'.
- Identifier:** A text box containing 'Ang_G1 por ejemplo o cualquier'.
- Buttons:** 'Go' and 'Close' buttons.

The background interface shows a table with columns for 'Exciter', 'In Service', 'Type', 'Turbine Governor', 'Stabilizer', 'Min Exciter', and 'Max Exciter'. The table contains three rows of data, all with 'None' values in the 'In Service' and 'Type' columns.

Output Bar:

```
SUMMARY OF MODELS READ:
GENS:  GENROU      GENSAL
        2          1

NEXT AVAILABLE ADDRESSES ARE:
CON STATE VAR ICON
 41   18   1    1

Only PSS/E supplied models in case. Compilation is not required
```

Simulación dinámica

Paso 7: Inicializar STRT

The screenshot displays the PSS/E Xplore software interface. The 'Dynamics' menu is open, and the 'Perform simulation (STRT/RUN)...' option is selected. A dialog box titled 'Perform Dynamic Simulation' is open, showing the following configuration:

- Initialization options:**
 - Channel output file: E:\ESEP\Clase_PSSE\Salida_Parte_1_200ms.outx
 - Automatically GNET for missing machine models
- Simulation options:**
 - Run to: -0.0167 (0.0083 secs)
 - Print every: 1 (time steps)
 - Write every: 1 (time steps)
 - Plot every: 0 (time steps)
 - Display network convergence monitor

Buttons at the bottom of the dialog are 'Run', 'Close', and 'Initialize'.

The background interface shows a 'Plot Tree' with a table of bus data:

Bus Number	Bus Name	Id
1	16.500	G1
2	18.000	G2
3	13.800	G3

The 'Output Bar' displays the following text:

```
GENS:  GENROU      GENSAL
        2          1

NEXT AVAILABLE ADDRESSES ARE:
CON  STATE  VAR  ICON
41   18     1    1

Only PSS/E supplied models in case. Compilation is not required.

CHANNEL  1 WITH IDENTIFIER "ANG_G1 POR EJEMPLO O CUALQUIER"
```

Simulación dinámica

Paso 7: Inicializar STRT

Number	Rating	Model	Capacity	Checked	Model	Checked	Model	Checked	Model	Checked	Model	Checked	Model	Checked	Model	Checked
1	16.500	G1	247.50	<input checked="" type="checkbox"/>	GENSAL	<input checked="" type="checkbox"/>	Std	None	<input type="checkbox"/>	None						
2	18.000	G2	192.00	<input checked="" type="checkbox"/>	GENROU	<input checked="" type="checkbox"/>	Std	None	<input type="checkbox"/>	None						
3	13.800	G3	128.00	<input checked="" type="checkbox"/>	GENROU	<input checked="" type="checkbox"/>	Std	None	<input type="checkbox"/>	None						

Machine Renewable Machine Induction Machine 2-Term DC VSC DC Multi-Term DC FACTS Switched Shunt Load - Bus Load - Owner Load - Zone Load - Area Load - All Branch 2 Winding 3 Winding /
Device Models Protection Models Other Models Data /

Output Bar

```
INITIAL CONDITION LOAD FLOW USED 1 ITERATIONS

----- MACHINE INITIAL CONDITIONS -----
BUS#-SCT X-- NAME --X BASKV ID ETERM EFD POWER VARS P.F. ANGLE ID IQ
1 16.500 G1 1.0400 1.0560 71.64 27.04 0.9356 1.47 0.1122 0.2755
2 18.000 G2 1.0250 1.2898 163.00 6.65 0.9992 43.46 0.4933 0.6662
3 13.800 G3 1.0250 1.2498 85.00 -10.86 0.9919 46.17 0.3674 0.5400

INITIAL CONDITIONS CHECK O.K.
```

Channel output file is "E:\FACULTAD\ESEP\Clase_PSSE\Salida_Parte_1_200ms.outx"

Progress Alerts/Warnings /

Simulación dinámica

Paso 8: RUN

Perform Dynamic Simulation

Initialization options

Channel output file ...

Automatically GNET for missing machine models

Simulation options

Run to 0.0083 secs

Print every time steps

Write every time steps

Plot every time steps

Display network convergence monitor

Simulación dinámica

Paso 9: BUS FAULT

The screenshot displays the PSS®E software interface. The 'Dynamics' menu is open, showing the 'Apply Disturbance' sub-menu with 'Bus fault...' selected. The 'Apply a Bus Fault' dialog box is in the foreground, with the following settings:

- Apply fault at bus (Number): 2
- Select... button
- Base kV: 0.00
- Units: OHM's (selected)
- Impedance: R = 0.0000, X = 0
- Buttons: OK, Cancel

The background shows a table with columns: In Service, Type, Stabilizer, In Service, Type, Min Exciter, In Service, Type, Max Exciter. The table contains three rows of data, all with 'None' values.

In Service	Type	Stabilizer	In Service	Type	Min Exciter	In Service	Type	Max Exciter
<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>
<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>
<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>

At the bottom, a table with columns: VARS, P.F., ANGLE, ID, IQ. The table contains three rows of data:

VARS	P.F.	ANGLE	ID	IQ
27.04	0.9356	1.47	0.1122	0.2755
6.65	0.9992	43.46	0.4933	0.6662
-10.86	0.9919	46.17	0.3674	0.5400

Below the table, the text 'ida_Parte_1_200ms.outx"' is visible.

Simulación dinámica

Paso 10: RUN 100ms

Perform Dynamic Simulation

Initialization options

Channel output file ...

Automatically GNET for missing machine models

Simulation options

Run to 0.0083 secs

Print every time steps

Write every time steps

Plot every time steps

Display network convergence monitor

Simulación dinámica

Paso 11: CLEAR FAULT

The screenshot shows the PSS®E software interface with the 'Clear Fault' dialog box open. The dialog box is titled 'Clear Fault' and contains a table for selecting an existing fault. The table has columns for fault ID, bus name, and a value. The first row is selected, showing fault ID 1, bus name 18.000, and a value of 1. The dialog box also has 'Go' and 'Close' buttons.

Select existing fault			
1	2	[18.000]	1

Go Close

Simulación dinámica

Paso 12: RUN 10 s

Perform Dynamic Simulation

Initialization options

Channel output file: E:\FACULTAD\ESEP\Clase_PSSE\Salida_Parte_1_200m

Automatically GNET for missing machine models

Simulation options

Run to: 10 (0.0083 secs)

Print every: 1 time steps

Write every: 1 time steps

Plot every: 0 time steps

Display network convergence monitor

Run Close Initialize

Simulación dinámica

Automatización en PYTHON

The screenshot displays the PSS/E software interface. The main window shows a 'Network Tree' on the left and a data table for 'Generator' parameters. A red arrow points from the 'Save As' dialog box to the 'Generator' table. The 'Save As' dialog is open, showing the file 'Parte_2.py' being saved in the 'Facultad (E)' directory.

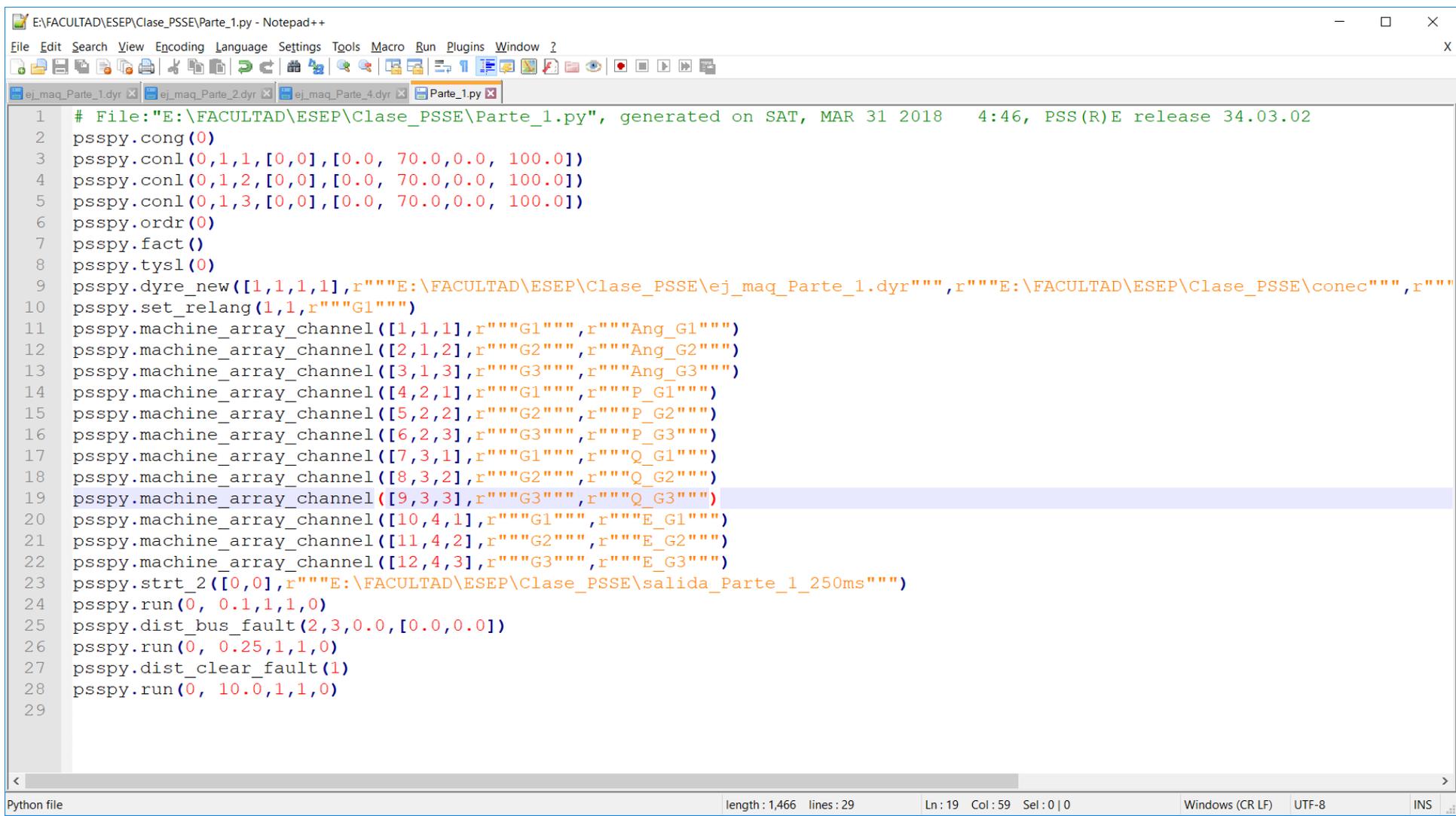
Bus Number	Bus Name	Id	Mbase (MVA)	In Service	Generator	In Service	Type	Exciter	In Service	Type	Turbine Governor	In Service	Type	Stabilizer	In Service	Type	Min Exciter	In Service	Type	Max Exciter
1	16.500	G1	247.50	<input checked="" type="checkbox"/>	GENSA	<input checked="" type="checkbox"/>	Std	None	<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>	None	<input type="checkbox"/>	None	<input type="checkbox"/>	None	None
2	18.000	G2	192.00	<input checked="" type="checkbox"/>	GENROU	<input checked="" type="checkbox"/>	Std	None	<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>	None	<input type="checkbox"/>	None	<input type="checkbox"/>	None	None
3	13.800	G3	128.00	<input checked="" type="checkbox"/>	GENROU	<input checked="" type="checkbox"/>	Std	None	<input type="checkbox"/>	None	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="checkbox"/>	None	<input type="checkbox"/>	None	<input type="checkbox"/>	None	None

Output Bar:

Bus Number	Mbase (MVA)	Id	1.0400	1.0560	71	163.00	6.65	0.9992	43.46	0.4933	0.6662	85.00	-10.86	0.9919	46.17	0.3674	0.5400
1	16.500	G1	1.0400	1.0560	71	163.00	6.65	0.9992	43.46	0.4933	0.6662	85.00	-10.86	0.9919	46.17	0.3674	0.5400
2	18.000	G2	1.0250	1.2898	163.00	6.65	0.9992	43.46	0.4933	0.6662	85.00	-10.86	0.9919	46.17	0.3674	0.5400	
3	13.800	G3	1.0250	1.2498	85.00	-10.86	0.9919	46.17	0.3674	0.5400							

Simulación dinámica

Automatización en PYTHON



```
E:\FACULTAD\ESEP\Clase_PSSE\Parte_1.py - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
ej_maq_Parte_1.dyr ej_maq_Parte_2.dyr ej_maq_Parte_4.dyr Parte_1.py
1 # File:"E:\FACULTAD\ESEP\Clase_PSSE\Parte_1.py", generated on SAT, MAR 31 2018 4:46, PSS(R)E release 34.03.02
2 psspy.cong(0)
3 psspy.conl(0,1,1,[0,0],[0.0,70.0,0.0,100.0])
4 psspy.conl(0,1,2,[0,0],[0.0,70.0,0.0,100.0])
5 psspy.conl(0,1,3,[0,0],[0.0,70.0,0.0,100.0])
6 psspy.ordr(0)
7 psspy.fact(0)
8 psspy.tysl(0)
9 psspy.dyre_new([1,1,1,1],r""E:\FACULTAD\ESEP\Clase_PSSE\ej_maq_Parte_1.dyr"",r""E:\FACULTAD\ESEP\Clase_PSSE\conec"",r""
10 psspy.set_relang(1,1,r""G1""")
11 psspy.machine_array_channel([1,1,1],r""G1"",r""Ang_G1""")
12 psspy.machine_array_channel([2,1,2],r""G2"",r""Ang_G2""")
13 psspy.machine_array_channel([3,1,3],r""G3"",r""Ang_G3""")
14 psspy.machine_array_channel([4,2,1],r""G1"",r""P_G1""")
15 psspy.machine_array_channel([5,2,2],r""G2"",r""P_G2""")
16 psspy.machine_array_channel([6,2,3],r""G3"",r""P_G3""")
17 psspy.machine_array_channel([7,3,1],r""G1"",r""Q_G1""")
18 psspy.machine_array_channel([8,3,2],r""G2"",r""Q_G2""")
19 psspy.machine_array_channel([9,3,3],r""G3"",r""Q_G3""")
20 psspy.machine_array_channel([10,4,1],r""G1"",r""E_G1""")
21 psspy.machine_array_channel([11,4,2],r""G2"",r""E_G2""")
22 psspy.machine_array_channel([12,4,3],r""G3"",r""E_G3""")
23 psspy.strt_2([0,0],r""E:\FACULTAD\ESEP\Clase_PSSE\salida_Parte_1_250ms""")
24 psspy.run(0,0.1,1,1,0)
25 psspy.dist_bus_fault(2,3,0.0,[0.0,0.0])
26 psspy.run(0,0.25,1,1,0)
27 psspy.dist_clear_fault(1)
28 psspy.run(0,10.0,1,1,0)
29
Python file length: 1,466 lines: 29 Ln: 19 Col: 59 Sel: 0 | 0 Windows (CR LF) UTF-8 INS
```

Simulación dinámica

Graficar canales de salida

The screenshot displays the PSS/E Xplore 34 software interface. The main window shows a file explorer for the directory 'E:\FACULTAD\ESEP\Clase_PSSE'. A file named 'salida_Parte_1_200ms.outx' is selected, and its context menu is open, showing options like 'Save Case file', 'Slider Binary file', and 'Channel file (*out, *outx)'. The 'Channel file' option is highlighted. Below the file explorer, the console window shows the following output:

```

INITIAL CONDITIONS CHECK O.K.

Channel output file is "E:\FACULTAD\ESEP\Clase_PSSE\Salida_Parte_1_200ms.outx"

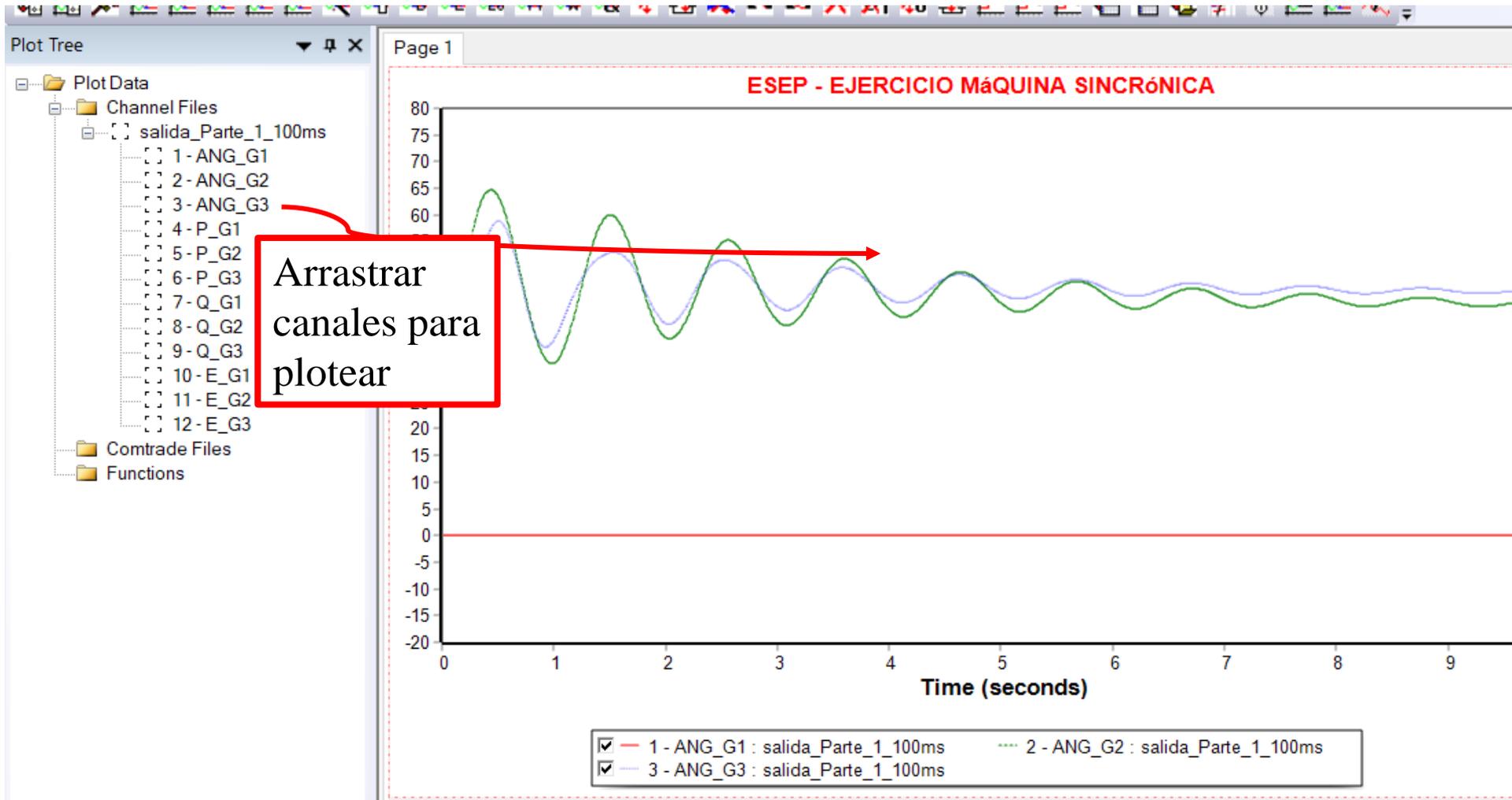
*** Shunt " 1" at bus 2 [          18.000] ( 0.0000,-0.20000E+12) added ***

*** Shunt " 1" at bus 2 [          18.000] ( 0.0000,-0.20000E+12) deleted ***
  
```

The background interface includes a menu bar with options like File, Edit, View, Data Grid, Power Flow, Short Circuit, OPF, Node-Breaker, Dynamics, Subsystem, Misc, I/O Control, Window, Integrations, and Help. The status bar at the bottom indicates 'Met convergence tolerances' and 'Bind items Next bus - 1'.

Simulación dinámica

Graficar canales de salida



Simulación dinámica

Graficar canales de salida

The screenshot displays the PSS/E Xplore 34 interface. The main window shows a plot titled "Page 1" with a red line graph. The y-axis is labeled "4 - P_G17 - Q_G110 - E_G110 - E_G110" and the x-axis is labeled "Time". The plot shows a transient response starting at time 0, with a peak value of approximately 5.0, followed by damped oscillations around a mean value of 1.0. The plot is titled "ARITHMETIC sqrt(A+B)/C".

The "Add Function" dialog box is open, showing the "Arithmetic Function" field with the expression $\sqrt{(A+B)/C}$. The "Channels" section has the "Add Data" checkbox checked. The "Channel File" section contains several empty input fields with dropdown arrows.

The "Plot Attributes" menu is open, showing options such as "Insert Page", "Insert Plot", "Plot Attributes", "Properties - Active Plot", "Delete Series", "Delete - All Plots", "Delete - Active Plot Page", "Delete - Active Plot", "Copy to Clipboard", "Multiple Y Axes", "CrossHair Cursor", "Chart Grid", "X-Y Plots", "Annotation", "Draw Lines", and "Resize Active Chart".

The "Output Bar" at the bottom of the window displays the following text:

```
50 BUS POWER SYSTEM SIMULATOR--  
INITIATED ON THU, APR 05 2  
New study initialized:
```

Simulación dinámica

Graficar canales de salida

