

**Wind INtegration Simulator
(WINSTM)**

User Manual

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1 Introduction

This manual is to introduce the web-based Graphical User Interface (GUI) for WINS. The Wind INtegration Simulator (WINS) would simulate the actual operation of power systems with the integration of volatile wind generation. The users of WINS are entities with full information of the system, such as the Independent System Operators (ISOs). The ISO has the overall information about the system and the market. In addition, generator and transmission line unavailability is considered in WINS and wind deliverability is analyzed for solutions.

WINS simulates the actual market operations which is based on the security-constrained unit commitment (SCUC) with full AC transmission and voltage constraints considered. The computational engine of WINS is written in Microsoft Visual C++, and the Graphical User Interface (GUI) is written in Microsoft Visual C# and ASP.NET. The database is based on ORACLE and can be extended to include other database formats as well. Microsoft Excel is used for the downloading reports.

WINS was first developed in 2002, when it was called PPower Market Simulator (POMS). However, numerous modifications and improvements have been introduced to the software based on its applications to various industrial projects.

2 WINS Installation

To use the web-based WINS, a user only needs to have an internet browser. The flowing discussion applies to the server side installation.

2.1 Hardware Requirements

- The Demo version of WINS needs at least 300MB of hard disk space.
- RAM: 512MB or higher
- Screen resolution: 1024×768 pixels or higher

2.2 Software Requirements

- WINS runs in Windows 2003 Server environment (32-bit or 64-bit).
- Internet Browser: Microsoft IE, Mozilla Firefox or Google Chrome.
- Microsoft Excel (version 2000 or version 2003) has to be installed.
- Microsoft .NET Framework 2.0 has to be installed.
- Oracle 11g ODAC 11.1.0.6.21 with Oracle Developer Tools (ODT) for Visual Studio has to be installed.

2.3 Install Microsoft .NET Framework 2.0

If the computer has been installed with Microsoft Visual Studio 2005, Microsoft .NET Framework 2.0 is already installed and this step can be skipped. Otherwise, search "Microsoft .NET Framework Version 2.0 Redistributable Package" on WEB and users will find "dotnetfx.exe" on microsoft.com. Download and double click it to install

Microsoft .NET Framework 2.0.

2.4 Install Oracle Data Access Components

Unzip "ODTwithODAC1110621.zip" and double click "setup.exe" to install Oracle Data Access Components. After installation, copy "sqlnet.ora" and "tnsnames.ora" files to corresponding directory. Modify the contents of "sqlnet.ora" and "tnsnames.ora", if necessary.

2.5 Install SCUC

- SCUC exe file: Create "C:\WINS\" directory and put SCUC project in it.
- Data importer: Copy "oracle_ctl.bat", "pre_load.sql", "post_load.sql" and directory "Oracle" which has a lot of "ctl" files to "C:\WINS\" directory.

2.6 Install WINS

- Use Visual Studio WebSetup project to deploy the WINS to the virtual directory to publish the website. The address of WINS is: <http://216.47.134.239/WINS>

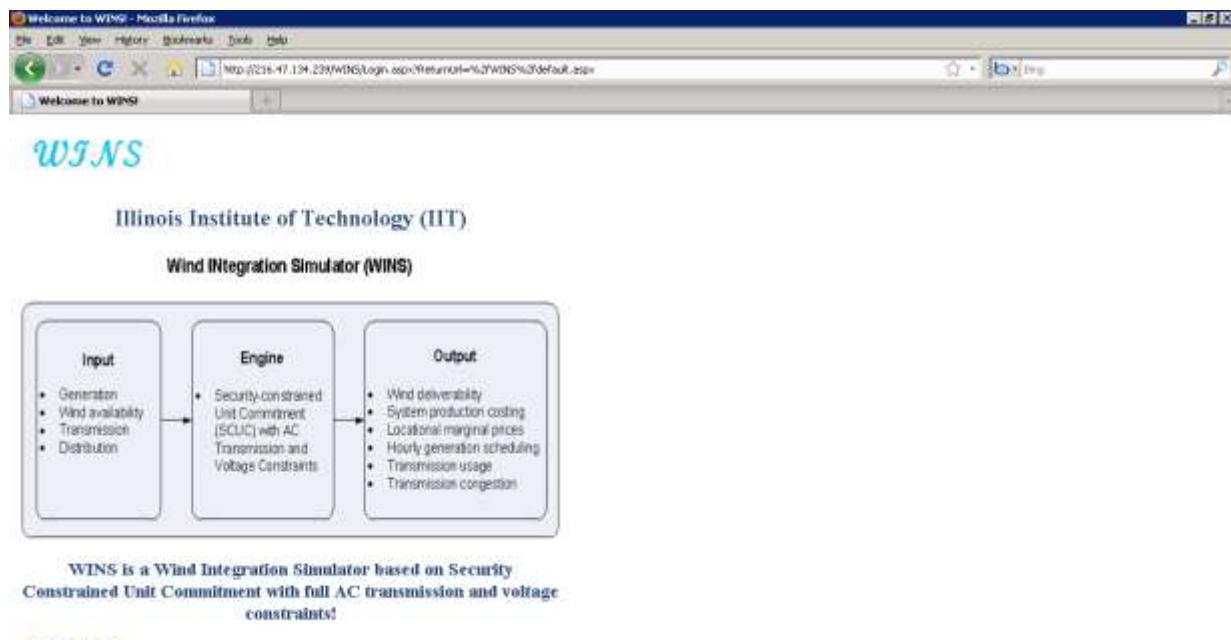
Note: Input data can be entered or modified through either web interface or database management tool. Database in Oracle can be accessed by "SQL*Plus" distributed with ODAC or "PL/SQL Developer" developed by a third company.

3 WINS Functions

Functions in WINS are presented here and various operations are explained.

3.1 Login

Enter "<http://216.47.134.239/WINS>" in the URL address bar of an internet browser to access WINS. The Login page displays as follows:



By clicking the [Please log in](#) Button, a user can go to the case management page with the following log information:

"User Name": doetest

"Password": doetest

	Delete	Case Name	Case Description	# Of Bus	# Of Branch	# Of Unit	Capacity (MW)	Created Time	Last Run Time
Edit	Delete	IEEE118BusWind_AC	IEEE118BusWind_AC	118	104	76	9288	7/10/2012 10:40:09 AM	8/6/2012 10:59:12 AM
Edit	Delete	IEEE118WithWind_AC	IEEE118WithWind_AC	118	104	79	11208	7/10/2012 1:15:15 PM	7/10/2012 1:15:15 PM
Edit	Delete	IEEE118WithWindVDC_AC	IEEE118WithWindVDC_AC	118	101	80	9900	7/10/2012 2:46:09 PM	8/10/2012 11:26:40 AM
Edit	Delete	IEEE118WithDC_DC	IEEE118WithDC_DC	118	104	76	9780	8/10/2012 10:23:13 AM	8/10/2012 10:24:31 AM
Edit	Delete	IEEE118WithWind_DC	IEEE118WithWind_DC	118	104	79	10288	8/10/2012 10:24:19 AM	8/10/2012 10:33:03 AM
Edit	Delete	IEEE118WithWindVDC_DC	IEEE118WithWindVDC_DC	118	101	80	9908	8/10/2012 10:59:02 AM	8/10/2012 11:09:03 AM

3.2 Manage Case

The case management page shown above lists all the cases which can be accessed by the account "doetest". A user can modify the basic case information or delete a case by clicking the "Edit" or "Delete" button in front of each case. By clicking the "Add Case" button, a user can build a new case. By clicking the "Case Name" of each case, a user can choose one case and begin to study the case.

3.2.1 Modify Case

By clicking the "Edit" button of a case, the following two columns of the case could be modified:

"Case Name" ---- name of the selected case;

"Case Description" ---- detailed comments of the selected case;

Delete	Case Name	Case Description	# Of Buses	# Of Branch	# Of Unit	Capacity (MW)	Created Time	Last Run Time
Delete	IEEE118NoWind_AC	IEEE118NoWind_AC	118	106	79	9388	7/16/2012 2:40:09 AM	7/16/2012 10:24:12 AM
Edit	IEEE118WithWind_AC	IEEE118WithWind_AC	118	106	79	11288	7/16/2012 2:15:15 PM	7/16/2012 2:15:15 PM
Edit	IEEE118WithWindHyDC_AC	IEEE118WithWindHyDC_AC	122	101	60	9808	7/16/2012 2:46:29 PM	7/16/2012 2:46:29 PM

By clicking the "Update" or "Cancel" button, a user can choose whether or not to accept the modification done before.

The other columns shown below could not be modified in the case management stage, which reflects the actual information during the case study stage.

"Created Time" ---- date when the selected case was created;

"Last Run Time" ---- date when the selected case was executed;

"# of Buses" ---- the total number of buses of the system of the selected case;

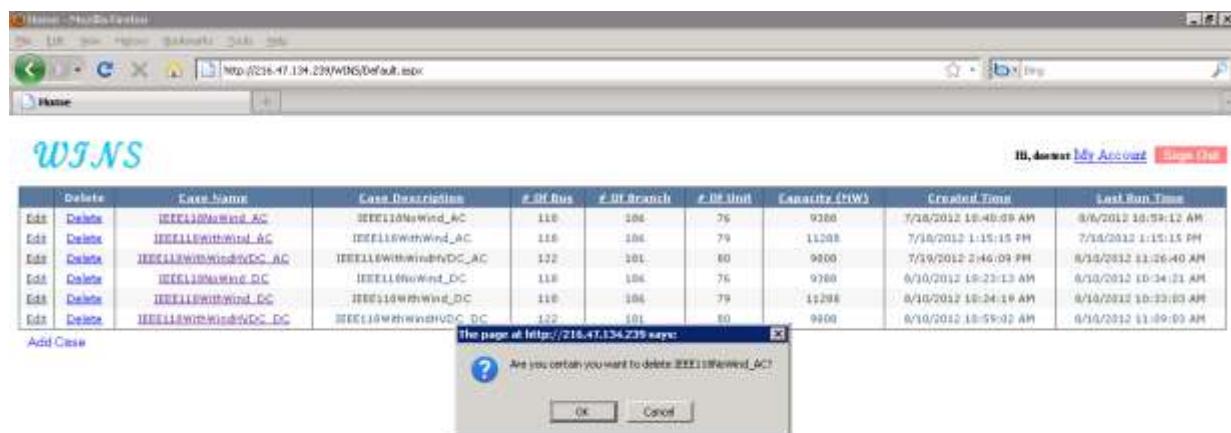
"# of Branches" ---- the total number of branches of the system of the selected case;

"# of Units" ---- the total number of generation units of the system of the selected case;

"Capacity (MW)" ---- the total installed capacity of the system of the selected case;

3.2.2 Delete Case

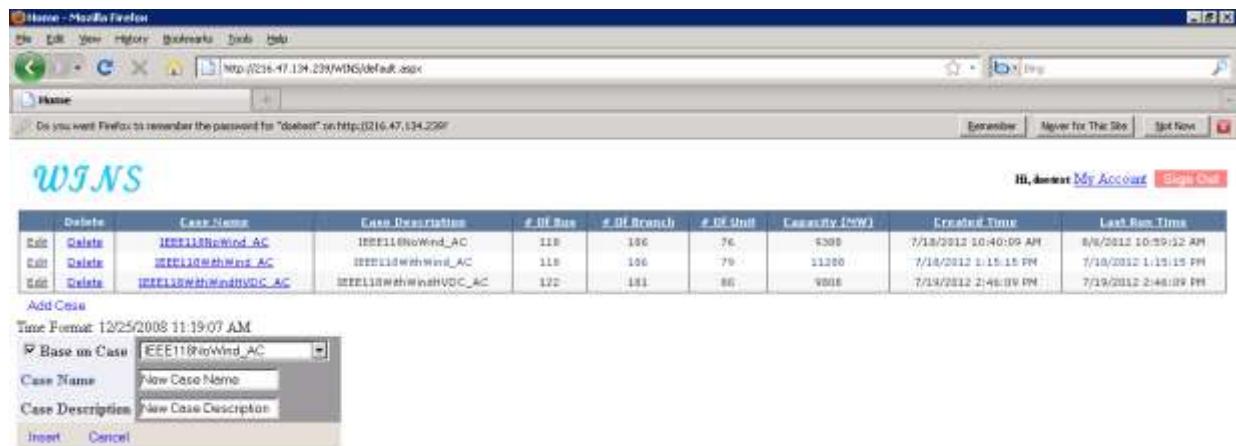
By clicking the "Delete" button in front of a case, a dialog box will pop-up to ask whether a user really wants to delete the selected case as shown below.



A user can click the "OK" button to commit the delete operation, or click the "Cancel" button to cancel the delete operation.

3.2.3 Add Case

Click the "Add Case" button, and input the Case Name and Case Description for the new case. A user can also choose to build a new base based on an existing case by checking the "Base on Case" checkbox, then click the "Insert" button to add the new case to the database. A user can also click the "Cancel" button to discard the new case.

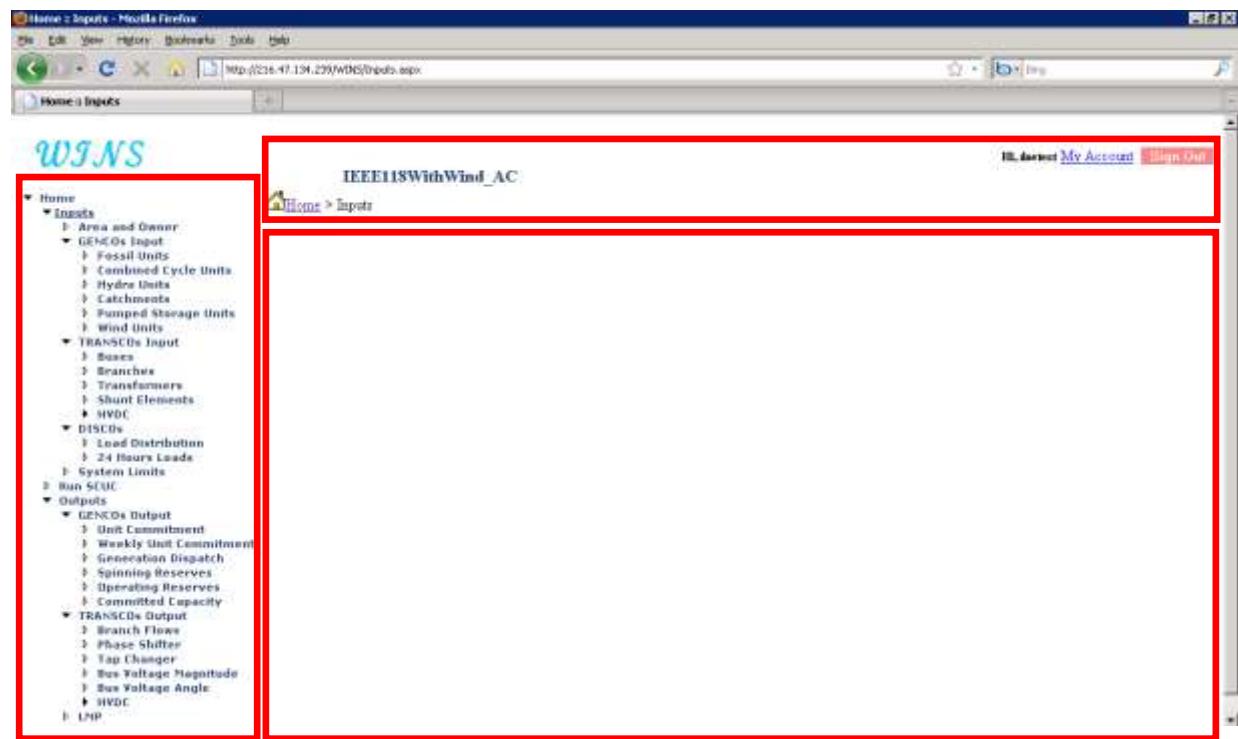


3.2.4 Choose Case

A user can choose a case to study by clicking the "Case Name" of the case, and the detailed case information will be displayed in the corresponding pages.

3.3 Site Map of WINS

The Site Map of WINS includes three areas: TreeView, Basic links, and Main content area. By clicking the "My Account" button, a user can reset the password for the account. The "Sign Out" button is placed on the right top of the site map for a user to log out of the WINS. Below the selected case name shows the site map path of current page, which provides a straightforward guidance for the user to understand the logic relationship of case information.



3.4 Inputs

Through the TreeView under the "Inputs" node, a user can view and modify all the following input data of WINS.

- Area and Owner: Area, Owner and Zone information of selected case.
- GENCOs, TRANSCOs, DISCOs Input: information related to market participants (GENCOs, TRANSCOs, and DISTCOs)
- System Limits: hourly system load, loss and spinning/operating reserve

3.4.1 Inputs – Area and Owner

Go to *Home->Inputs ->Area and Owner* to view the list of area, zone, and market participant entities of the system.

Area Management				Owner Management				Zone Management			
		Add New Area				Add New Owner				Add New Zone	
		Area Name	Area ID			Owner Name	OWNERID	OWNER TYPE		Name	ZONEID
Edit	Delete	Area1	0	Edit	Delete	DISTCO1	201	DISTCO	Edit	Zone1	1
Edit	Delete	Area1	1	Edit	Delete	DISTCO2	202	DISTCO	Edit	Zone2	2
Edit	Delete	Area2	2	Edit	Delete	DISTCO3	203	DISTCO	Edit	Zone3	3
Edit	Delete	Area3	3	Edit	Delete	DISTCO4	204	DISTCO			
Edit	Delete			Edit	Delete	DISTCO5	205	DISTCO			
Edit	Delete			Edit	Delete	DISTCO6	206	DISTCO			
Edit	Delete			Edit	Delete	GENCO1	1	GENCO			
Edit	Delete			Edit	Delete	GENCO2	2	GENCO			
Edit	Delete			Edit	Delete	GENCO3	3	GENCO			
Edit	Delete			Edit	Delete	TRANSCO1	101	TRANSCO			
Edit	Delete			Edit	Delete	TRANSCO2	102	TRANSCO			
Edit	Delete			Edit	Delete	TRANSCO3	103	TRANSCO			
Edit	Delete			Edit	Delete	TRANSCO4	104	TRANSCO			

The "Add New Area" button allows a user to add more Areas to the current system. The "Edit" and "Delete" buttons in front of each existing area allow a user to edit or delete the chosen area information. The "Edit" operation allows a user to edit the name of the area, while the "Delete" operation will delete the area and all the components such as units, buses, and branches corresponding to the area in the system.

The "Add New Owner" button allows a user to add more Owners to the current system. The "Edit" and "Delete" buttons in front of each existing owner allow a user to edit or delete the chosen owner information. The "Edit" operation allows a user to edit the name, and choose the owner type (GENCO, TRANSCO or DISTCO) of the owner, while the "Delete" operation will delete the owner and all the components such as units, buses, and branches corresponding to the owner in the system.

The "Add New Zone" button allows a user to add more Zones to the current system. The "Edit" and "Delete" buttons in front of each existing zone record allow a user to edit or delete the chosen zone information. The "Edit" operation allows a user to edit the name of the zone, while the "Delete" operation will delete the zone and all the components such as units, buses, and branches corresponding to the zone from the system.

3.4.2 Inputs – GENCOs Input

Go to *Home->Inputs ->GENCOs Input* to view the overall information of the GENCOs. Five major categories of units are available: fossil, combined cycle, hydro, pumped-storage and wind units.

This page displays the list of GENCOs, and the statistic information about the numbers of different type of units belonging to each GENCO. The "Download Data" button allows users to download the GENCOs related data listed in the table.

Owner	Number of Fossil Units	Number of Combined Cycle Units	Number of Hydro Units	Number of Pumped Storage Units	Number of Wind Units
GENCO1	11	5	0	0	1
GENCO2	10	4	4	0	0
GENCO3	4	3	0	2	2

Go to *Home->Inputs ->GENCOs Input->Fossil Units* to view the detailed information on each fossil unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the fossil units table, a user can choose to display the fossil units of individual GENCOs or all the fossil units. The "Download Data" button allows a user to download the detailed fossil units related data listed in the table. The "Add New Unit" button allows a user to add more fossil units to the current system. The "Edit" and "Delete" buttons in front of each existing fossil unit record allow a user to edit or delete the chosen unit information. The "Edit" operation allows a user to edit the detailed information of the selected unit, while the "Delete" operation will delete the unit from the system.

The screenshot shows a web browser window for Mozilla Firefox displaying the WINS (Windows Integrated Network System) user interface. The URL is <http://128.47.134.239/WINS/GENCOsUnits.aspx>. The main content area is titled "IEEE118WithWind_AC" and shows a table of "Fossil Units". The table has columns for Unit Name, Area Name, Owner Name, Plant, Bus No, Unit ID, Min Capacity (MW), Max Capacity (MW), Min Capacity (MVAR), Max Capacity (MVAR), Min Up Time (hours), Max Up Time (hours), Min Down Time (hours), Max Down Time (hours), Ramp Up (MW/hour), Ramp Down (MW/hour), Quick Start Capability (MW), and Max Sust. Ramp (MW/min). The table contains 10 rows of data, each representing a fossil unit (T02 to T11) with its specific parameters.

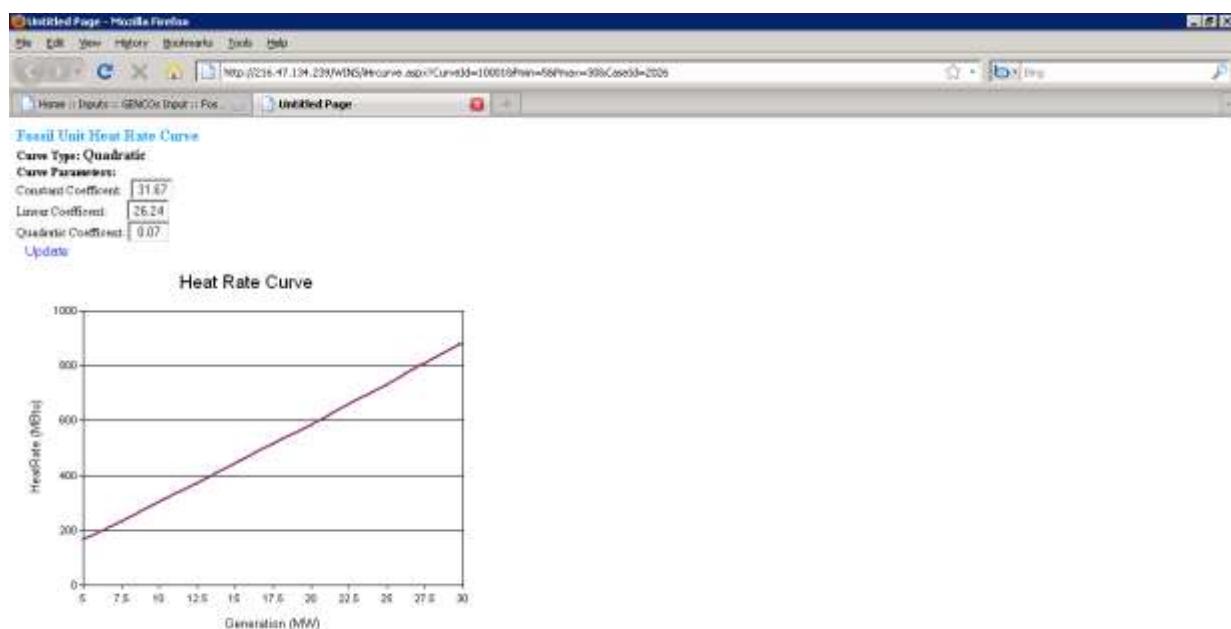
Unit Name	Area Name	Owner Name	Plant	Bus No	Unit ID	Min Capacity (MW)	Max Capacity (MW)	Min Capacity (MVAR)	Max Capacity (MVAR)	Min Up Time (hours)	Max Up Time (hours)	Min Down Time (hours)	Max Down Time (hours)	Ramp Up (MW/hour)	Ramp Down (MW/hour)	Quick Start Capability (MW)	Max Sust. Ramp (MW/min)
T02	Area2	GENCO1	Plant 0	4	1	5.00	10.00	-300.00	300.00	1	1	15.00	15.00	30.00	3		
T02	Area2	GENCO2	Plant 0	6	1	5.00	20.00	-13.00	50.00	1	1	15.00	15.00	30.00	3		
T03	Area1	GENCO1	Plant 0	8	1	5.00	30.00	-300.00	300.00	1	1	15.00	15.00	30.00	3		
T04	Area2	GENCO1	Plant 0	10	1	150.00	300.00	-147.00	200.00	0	0	150.00	150.00	0.00	2		
T05	Area2	GENCO3	Plant 0	12	1	100.00	300.00	-35.00	120.00	0	0	150.00	150.00	0.00	2		
T06	Area2	GENCO2	Plant 0	15	1	10.00	20.00	-15.00	50.00	1	1	15.00	15.00	30.00	3		
T07	Area3	GENCO1	Plant 0	18	1	25.00	120.00	-18.00	50.00	5	5	30.00	50.00	0.00	3		
T08	Area2	GENCO1	Plant 0	19	1	5.00	10.00	-8.00	24.00	1	1	15.00	15.00	30.00	3		
T09	Area2	GENCO1	Plant 0	24	1	5.00	10.00	-300.00	300.00	1	1	15.00	15.00	30.00	3		
T10	Area2	GENCO2	Plant 0	25	1	150.00	300.00	-47.00	140.00	0	0	150.00	150.00	0.00	2		

The description of individual columns of the fossil unit table is as follows:

Unit Name	unit name (string, no space)
Area Name	area name (string, no space)
Owner Name	owner name (string, no space)
Plant	plant name (string, no space)
Bus No	bus number where the unit is located (long integer)
Unit ID	unit ID (string, no space)
Min Capacity	minimum real power capacity (MW) (double)
Max Capacity	maximum real power capacity (MW) (double)
Min Capacity	minimum reactive power capacity (MVAR) (double)
Max Capacity	maximum reactive power capacity (MVAR) (double)
Min Up Time	minimum on-operation time (hour, >0) (integer)
Min Down Time	minimum off-operation time (hour, >0) (integer)
Ramp Up	ramping up rate (MW/hour). Less than or equal to MSR (double)
Ramp Down	ramping down rate (MW/hour). Less than or equal to MSR (double)
Quick Start Capability	quick start capability (MW) (double)
Max Sust. Ramp	maximum sustained ramping rate (MW/min) (double)
Number of Minutes	number of minutes for MSR (Minutes) (integer)
Initial Hours	initial operating time (hour, >0 ON, <0 OFF) (integer)
Initial MW	initial operating MW (double)
Fuel Type	fuel type (string)
Fuel Price	fuel price (\$/MBtu) (double)
MBtu/MW Curve	heat rate curve index (long integer)
Startup Fuel Type	startup fuel type (string)

Startup Fuel Price	startup fuel price (\$/MBtu) (double)
Startup Fuel Curve	startup fuel curve index (MBtu consumption as a function of startup hours) (long integer)
Shutdown Fuel Type	shutdown fuel type (string, take values defined in Sheet "Global Definition")
Shutdown Fuel Price	shut down fuel price (\$/MBtu) (double)
SO2 Curve	SO2 emission curve index (long integer)
NOx Curve	NOx emission curve index (long integer)
Ramp Up Curve	ramp up curve index (long integer)
Ramp Up Time	ramp up time (Minutes) (integer)
Ramp Down Curve	ramp up curve index (long integer)
Ramp Down Time	ramp down time (Minutes) (integer)

When a user clicks any "curve" data hyperlink in the table, a new page will pop up to show the detailed curve information. For example, by clicking the "MBtu/MW Curve" data "10001", the following new page shows the heat rate curve of Unit "TG1". A user can modify the parameters for the heat rate curve by changing the data in the textboxes and clicking the "Update" button to commit the changes.



Go to *Home->Inputs ->GENCOs Input->Combined Cycle Units* to view the detailed information on each combined cycle unit in the system. Besides, by selecting the different items in the dropdown list on the top left of the combined cycle units table, a user can choose to display the units of individual GENCOs units or all the units. The "Download Data" button allows a user to download the detailed combined cycle units related data listed in the table. The "Add New Unit" button allows a user to add more combined cycle units to the current system. The "Edit" and "Delete" buttons in front of each existing combined cycle unit record allow a user to edit or delete the chosen unit information. The "Edit" operation allows a user to edit the detailed information of the selected unit, while the "Delete" operation will delete the unit from the system.

	Delete	Unit Name	Area Name	Owner Name	Plant Id	Bus Id	Unit Id	Min Capacity (MW)	Max Capacity (MW)	Min Capacity (MWh)	Max Capacity (MWh)	Min Up Time (Hours)	Max Down Time (Hours)	Ramp Up (MW/hour)	Ramp Down (MW/hour)	Quick Start (MW)
Edit Select	Delete	CC1	AreaB	GENCO01	0	12	C1	0.00	75.00	-75.00	75.00	2	2	75.00	75.00	75.00
Edit Select	Delete	CC2	AreaB	GENCO03	0	61	C1	0.00	75.00	-75.00	75.00	2	3	75.00	75.00	75.00
Edit Select	Delete	CC3	AreaB	GENCO03	0	62	C1	0.00	75.00	-75.00	75.00	2	3	75.00	75.00	75.00
Edit Select	Delete	CC4	AreaB	GENCO03	0	66	C1	0.00	100.00	-100.00	100.00	2	3	100.00	100.00	100.00
Edit Select	Delete	CC5	AreaB	GENCO02	0	49	C1	0.00	75.00	-75.00	75.00	2	3	75.00	75.00	75.00
Edit Select	Delete	CC6	AreaB	GENCO02	0	49	C2	0.00	75.00	-75.00	75.00	2	3	75.00	75.00	75.00
Edit Select	Delete	CC7	AreaB	GENCO02	0	69	C1	0.00	100.00	-100.00	100.00	2	3	100.00	100.00	100.00
Edit Select	Delete	CC8	AreaB	GENCO02	0	61	C2	0.00	100.00	-100.00	100.00	2	3	100.00	100.00	100.00
Edit Select	Delete	CC9	AreaB	GENCO03	0	69	C1	0.00	100.00	-100.00	100.00	2	3	100.00	100.00	100.00
Edit Select	Delete	CC10	AreaB	GENCO01	0	113	C1	0.00	100.00	-100.00	100.00	2	3	100.00	100.00	100.00

Different from other units, there is a "Select" button in front of each existing combined cycle unit record. When a user clicks to choose different combined cycle unit, all its modes will be displayed correspondingly in the mode table below the unit table on the same page. For example, by clicking the "Select" button of unit "CC1", the following page shows all the modes that belong to "CC1".

Delete	Unit ID	Area Name	Owner Name	Plant	Bus No	Min Capacity (MW)	Max Capacity (MW)	Min Capacity (MVar)	Max Capacity (MVar)	Min Up Time (Hours)	Max Down Time (Hours)	Ramp Up (MW/hour)	Ramp Down (MW/hour)	Last Update		
Edit Select	Delete	CC1	Areal	GENCO1	0	1F	C1	5.00	75.00	-75.00	75.00	2	3	75.00	75.00	7
Edit Select	Delete	CC2	Areal	GENCO2	0	42	C1	5.00	75.00	-75.00	75.00	2	3	75.00	75.00	7
Edit Select	Delete	CC3	Areal	GENCO3	0	42	C1	5.00	75.00	-75.00	75.00	2	3	75.00	75.00	7
Edit Select	Delete	CC4	Areal	GENCO3	0	66	C1	8.00	100.00	-100.00	100.00	2	3	100.00	100.00	10
Edit Select	Delete	CC5	Areal	GENCO2	0	49	C1	8.00	75.00	-75.00	75.00	2	3	75.00	75.00	7
Edit Select	Delete	CC6	Areal	GENCO2	0	49	C2	8.00	75.00	-75.00	75.00	2	3	75.00	75.00	7
Edit Select	Delete	CC7	Areal	GENCO2	0	99	C1	8.00	100.00	-100.00	100.00	2	3	100.00	100.00	10
Edit Select	Delete	CC8	Areal	GENCO2	0	41	C2	8.00	100.00	-100.00	100.00	2	3	100.00	100.00	10
Edit Select	Delete	CC9	Areal	GENCO2	0	80	C1	8.00	100.00	-100.00	100.00	2	3	100.00	100.00	10
Edit Select	Delete	CC10	Areal	GENCO3	0	121	C1	8.00	100.00	-100.00	100.00	2	3	100.00	100.00	10

Delete	Mode ID	Number of CT	Number of ST	Min Capacity (MW)	Max Capacity (MW)	Min Capacity (MVar)	Max Capacity (MVar)	Min Up Time
Edit	Delete	0	0	0.00	0.00	0.00	0.00	1
Edit	Delete	1	1	0	5.00	25.00	-4.00	20.00
Edit	Delete	2	2	0	10.00	50.00	-6.00	40.00
Edit	Delete	3	1	1	7.50	37.50	-6.00	30.00
Edit	Delete	4	2	1	15.00	75.00	-12.00	60.00

The "Add New Mode" button allows a user to add more modes to the selected combined cycle unit. The "Edit" and "Delete" buttons in front of each existing mode record allow a user to edit or delete the chosen mode of the selected unit. The "Edit" operation allows a user to edit the detailed information of the mode, while the "Delete" operation will delete the mode from the unit.

The description of individual columns of the combined cycle unit table is as follows:

Unit Name	unit name (string, no space)
Area Name	area name (string, no space)
Owner Name	owner name (string, no space)
Plant	plant name (string, no space)
Bus No	bus number where the unit is located (long integer)
Unit ID	unit ID (string, no space)
Min Capacity	minimum real power capacity (MW) (double)
Max Capacity	maximum real power capacity (MW) (double)
Min Capacity	minimum reactive power capacity (MVAR) (double)
Max Capacity	maximum reactive power capacity (MVAR) (double)
Min Up Time	minimum on-operation time (hour, >0) (integer)
Min Down Time	minimum off-operation time (hour, >0) (integer)
Ramp Up	ramping up rate (MW/hour). Less than or equal to MSR (double)

Ramp Down	ramping down rate (MW/hour). Less than or equal to MSR (double)
Quick Start Capability	quick start capability (MW) (double)
Max Sust. Ramp	maximum sustained ramping rate (MW/min) (double)
Number of Minutes	number of minutes for MSR (Minutes) (integer)
Initial Mode	initial operating mode (0 stands for OFF)
Initial Hours	initial operating time (hour, >0 ON, <0 OFF) (integer)
Initial MW	initial operating MW (double)
Number of Mode	number of modes (integer)
Number of CT	number of CT (integer)
Number of ST	number of ST (integer)
Fuel Type	fuel type (string)
Fuel Price	fuel price (\$/MBtu) (double)
MBtu/MW Curve	heat rate curve index (long integer)

CT Information:

CT Startup Fuel Type	startup fuel type (string)
CT Startup Fuel Price	startup fuel price (\$/MBtu) (double)
CT Startup Fuel Curve	startup fuel curve index (MBtu consumption as a function of startup hours) (long integer)
CT Shutdown Fuel Type	shutdown fuel type (string, take values defined in Sheet "Global Definition")
CT Shutdown Fuel Price	shut down fuel price (\$/MBtu) (double)

ST Information:

ST Startup Fuel Type	ST startup fuel type (string)
ST Startup Fuel Price	ST startup fuel price (\$/MBtu) (double)
ST Startup Fuel Curve	ST startup fuel curve index (MBtu as a function of startup hours) (long integer)
ST Shutdown Fuel Type	ST shutdown fuel type (string)
ST Shutdown Fuel Price	ST shutdown fuel price (\$/MBtu) (double)

The description of individual columns of mode table is as follows:

Mode No	mode number (integer, positive)
Number of CT	number of CTs in the mode (integer, non-negative)
Number of ST	number of STs in the mode (integer, non-negative)
Min Capacity	minimum real power capacity of the mode (MW) (double)
Max Capacity	maximum real power capacity of the mode (MW) (double)
Min Capacity	minimum reactive power capacity of the mode (MVAR) (double)
Max Capacity	maximum reactive power capacity of the mode (MVAR)

	(double)
Ramp Up	ramping up rate of the mode (MW/hour). Less than or equal to MSR (double)
Ramp Down	ramping down rate of the mode (MW/hour). Less than or equal to MSR (double)
MBtu/MW Curve	heat rate curve index of the mode (long integer)
Nox Curve	NOx emission curve of the mode (long integer)

When a user clicks any "curve" data hyperlink in the table, a new page will pop up to show the detailed curve information. The curve types of combined cycle units are very similar to those of fossil units.

Go to *Home->Inputs ->GENCOs Input->Hydro Units* to view the detailed information on each hydro unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the hydro units table, a user can choose to display the units of individual GENCOs or all the hydro units. The "Download Data" button allows a user to download the detailed hydro units related data listed in the table. The "Add New Unit" button allows a user to add more hydro units to the current system. The "Edit" and "Delete" buttons in front of each existing hydro unit record allow a user to edit or delete the chosen unit information. The "Edit" operation allows a user to edit the detailed information of the selected unit, while the "Delete" operation will delete the unit from the system.

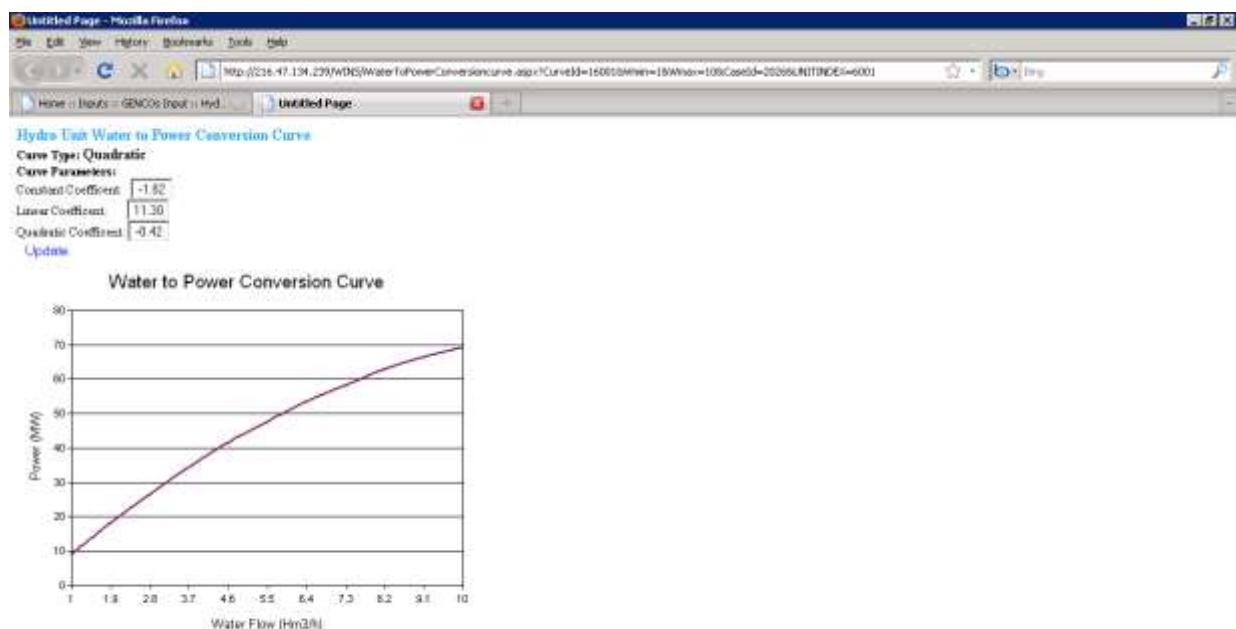
Delete	Unit Name	Plant	Owner Name	Unit ID	Bus No	Min Capacity (Mw)	Max Capacity (Mw)	Run Up Time (Hours)	Run Down Time (Hours)	Initial Hours	Water Power Conversion Curve	Startup Cost Curve	Natural Flow (Nm ³ /s)	Spillage (Nm ³ /s)	Lower Limit Discharge (Nm ³ /s)	Upper Limit Discharge (Nm ³ /s)
Edit	H1	plant0	GENCO0	HL	19	-9.00	70.00	1	1	0	16021	26101	-4.00	0.00	1.00	10.0
Edit	H2	plant1	GENCO1	HL	24	-6.00	70.00	1	1	0	16022	26102	0.00	0.00	1.00	10.0
Edit	H3	plant2	GENCO2	HL	25	-17.00	115.00	1	1	0	16023	26103	2.00	0.00	1.00	20.0
Edit	H4	plant0	GENCO0	HL	88	-20.00	134.00	1	1	0	16024	26104	8.25	0.00	1.50	20.0
Edit	H5	plant1	GENCO1	HL	90	-9.00	80.00	1	1	0	16025	26105	0.00	0.00	1.00	10.0
Edit	H6	plant1	GENCO1	HL	91	-2.00	60.00	1	1	0	16026	26106	0.00	0.00	1.00	10.0
Edit	H7	plant0	GENCO0	HL	103	-19.00	120.00	1	1	0	16027	26107	4.22	0.00	1.00	20.0

The description of individual columns of the hydro unit table is as follows:

Unit Name	unit name (string, no space)
Plant	plant name (string, no space)
Owner Name	owner name (string, no space)
Unit ID	unit ID (string, no space)
Bus No	bus number where the unit is located (long integer)
Min Capacity	minimum real power capacity (MW) (double)
Max Capacity	maximum real power capacity (MW) (double)
Min Capacity	minimum reactive power capacity (MVAR) (double)
Max Capacity	maximum reactive power capacity (MVAR) (double)
Initial Hours	initial operating time (hour, >0 ON, <0 OFF) (integer)
Water Power Conversion Curve	water to power conversion curve index (long integer)
Startup Cost Curve	start up cost curve index (long integer)

Natural Inflow	natural inflow (Hm ³ /h) (double)
Spillage	maximum spillage (Hm ³ /h) (double)
Lower Limit Discharge	lower limit of water discharge (Hm ³ /h) (double)
Upper Limit Discharge	upper limit of water discharge (Hm ³ /h) (double)
Initial Reservoir Volume	initial reservoir volume level (Hm ³) (double)
Terminal Reservoir Volume	terminal reservoir volume level (Hm ³) (double)
Lower Limit Reservoir Volume	lower limit of reservoir volume (Hm ³) (double)
Upper Limit Reservoir Volume	upper limit of reservoir volume (Hm ³) (double)

When a user clicks any "curve" data hyperlink in the table, a new page will pop up to show the detailed curve information. There is a unique curve of hydro unit: Water Power Conversion Curve, which is a quadratic function showing the relationship between the natural water flow and the power generation of the hydro unit. For example, by clicking the hyperlink "16001", the following new page shows the water power conversion curve of Unit "H1". User can modify the parameters for the curve by changing the data in the textboxes and clicking the "Update" button to commit changes.



Go to *Home->Inputs ->GENCOs Input->Catchment* to view the detailed information on each hydro catchment of the system. The "Download Data" button allows a user to download the detailed catchment related data listed in the table. The "Add New Catchment" button allows a user to add more hydro catchment to the current system, which requires at least two different hydro units existing in the current system. The "Edit" and "Delete" buttons in front of each existing hydro catchment record allow a user to edit or delete the chosen catchment information. The "Edit" operation allows a user to edit the up stream and down stream hydro units of the selected catchment, while the "Delete" operation will delete the hydro catchment from the system.

	Catchment Index	Up Stream Unit	Down Stream Unit	Discharge Delay Time (Hours)
Edit	1	H1	H2	2
Delete	1	H2	H3	2
Edit	1	H3	H4	2
Delete	1	H4	N/A	2
Edit	2	H5	H6	3
Delete	2	H6	H7	3
Edit	2	H7	N/A	3

The description of individual columns of the catchment table is as follows:

Catchment Index	hydro catchment index (integer)
Up Stream Unit	up stream hydro unit name of catchment (string, no space)
Down Stream Unit	down stream hydro unit name of catchment (string, no space)
Discharge Delay Time	discharge delay time from up to down stream unit (Hour) (integer)

Go to *Home->Inputs ->GENCOs Input->Pumped Storage Units* to view the detailed information on each pumped storage unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the pumped storage units table, a user can choose to display each individual GENCO's units list or all the pumped storage units. The "Download Data" button allows a user to download the detailed pumped storage units related data listed in the table. The "Add New Unit" button allows a user to add more pumped storage units to the current system. The "Edit" and "Delete" buttons in front of each existing pumped storage unit record allow a user to edit or delete the chosen unit information. The "Edit" operation allows a user to edit the detailed information of the selected unit, while the "Delete" operation will delete the unit from the system.

	Delete	Unit Name	Plant	Owner Name	Unit ID	Bus No	Min Capacity (MW)	Max Capacity (MW)	Min Capacity (MVAR)	Max Capacity (MVAR)	Min Up Time (hours)	Min Down Time (hours)	Min Gen Time (hours)	Initial Loading Status	Initial Hours	Last Generation Discharge (MWh/2h)	Upper Limit Generation Discharge (MWh/2h)	Lower Limit Generation Discharge (MWh/2h)	Last Pump Discharge (MWh)
P91	Edit	Unit 0	GENCO0	St. 91	36	24.00	100.00	-20.00	100	1	1	1	0	1	5.00	25.00	5		
P92	Edit	Unit 0	GENCO0	St. 77	34	24.00	100.00	-20.00	100	1	1	0	1	5.00	25.00	5			
P93	Edit	Unit 0	GENCO0	St. 69	34	24.00	204.00	-24.00	204	1	1	0	1	7.00	20.00	1			

The description of individual columns of the pumped storage unit table is as follows:

Unit Name	unit name (string, no space)
Plant	plant name (string, no space)
Owner Name	owner name (string, no space)
Unit ID	unit ID (string, no space)
Bus No	bus number where the unit is located (long integer)
Min Capacity	minimum real power capacity (MW) (double)
Max Capacity	maximum real power capacity (MW) (double)
Min Capacity	minimum reactive power capacity (MVAR) (double)
Max Capacity	maximum reactive power capacity (MVAR) (double)
Min Up Time	minimum on-operation time (hour, >0) (integer)
Min Down Time	minimum off-operation time (hour, >0) (integer)
Initial Loading Status	initial operating state (0: idle, 1: generating, -1: pumping) (integer)

Initial Hours	initial operating time (hours, nonnegative) (integer)
Lower Limit Generation Discharge	generation discharge lower limit (Hm ³ /h) (double)
Upper Limit Generation Discharge	generation discharge upper limit (Hm ³ /h) (double)
Lower Limit Pumping Discharge	pumping discharge lower limit (Hm ³ /h) (double)
Upper Limit Pumping Discharge	pumping discharge upper limit (Hm ³ /h) (double)
Initial Upstream Reservoir Volume	initial upstream reservoir volume level (Hm ³) (double)
Terminal Upstream Reservoir Volume	terminal upstream reservoir volume level (Hm ³) (double)
Lower Limit Upstream Reservoir Volume	lower limit of upstream reservoir volume (Hm ³) (double)
Upper Limit Upstream Reservoir Volume	upper limit of upstream reservoir volume (Hm ³) (double)
Initial Downstream Reservoir Volume	initial downstream reservoir volume level (Hm ³) (double)
Terminal Downstream Reservoir Volume	terminal downstream reservoir volume level (Hm ³) (double)
Lower Limit Downstream Reservoir Volume	lower limit of downstream reservoir volume (Hm ³) (double)
Upper Limit Downstream Reservoir Volume	upper limit of downstream reservoir volume (Hm ³) (double)
Water Power Conversion Curve Generation	water to power conversion curve index (generation mode) (long integer)
Water Power Conversion Curve Pumping	water to power conversion curve index (pumping mode) (long integer)
Generation Min ON	minimum operating time in generation mode (integer, positive)
Pumping Min On	minimum operating time in pumping mode (integer, positive)

When a user clicks any "curve" data hyperlink in the table, a new page will pop up to show the detailed curve information. The curve types of pumped storage units for the water power conversion curves in generation and pumping modes are very similar to those hydro units' water power conversion curves.

Go to *Home->Inputs ->GENCOs Input->Wind Units* to view the detailed information on each wind unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the wind units table, a user can choose to display each individual GENCO's units list or all the wind units. The "Download Data" button allows a user to download the detailed wind units related data listed in the table. The "Add New Unit" button allows a user to add more wind units to the current system. The "Edit" and "Delete" buttons in front of each existing wind unit record allow a user to edit or delete the chosen unit information. The "Edit" operation allows a user to edit the detailed information of the selected unit, while the "Delete" operation will delete the unit from the system.

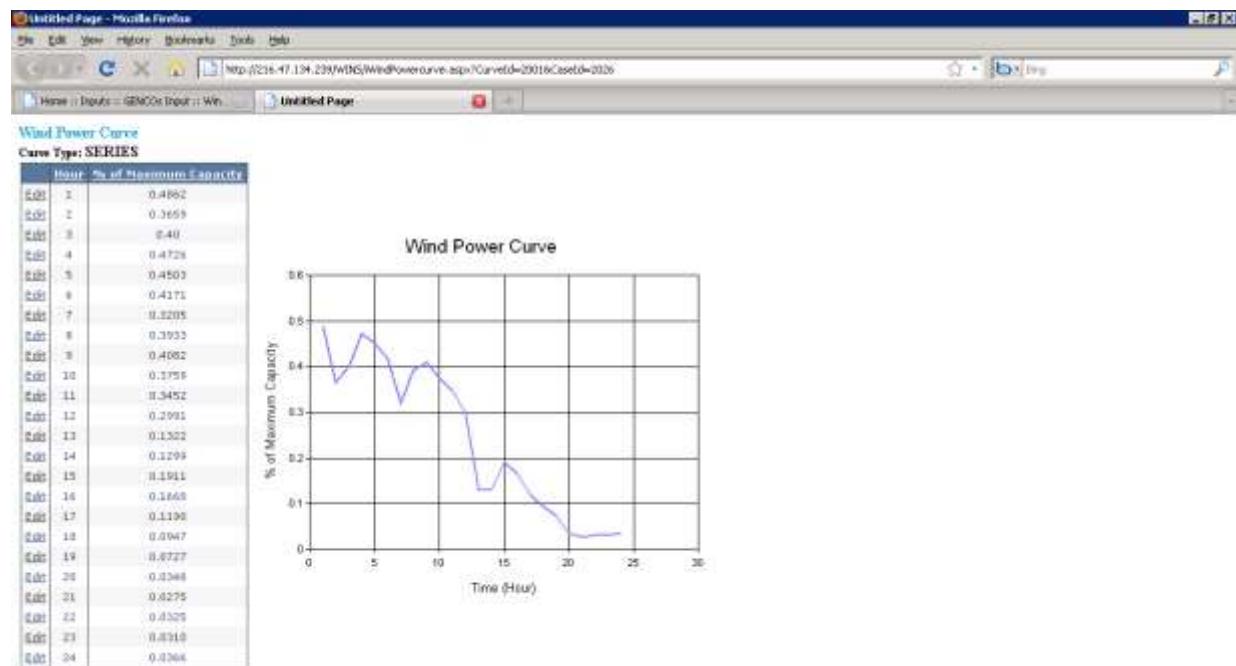
Delete	Unit Name	Owner Name	Unit ID	Bus No	Min Capacity (MW)	Max Capacity (MW)	Min Capacity (MVAR)	Max Capacity (MVAR)	Wind Power Curve
Edit	W1	GENCO3	W	36	0.00	562.50	-22.50	112.50	2010
Edit	W2	GENCO3	W	77	0.00	500.00	-20.00	100.00	2001
Edit	W3	GENCO3	W	69	0.00	837.50	-33.50	167.50	2001

Description of individual columns of the wind unit table is as follows:

Unit Name	unit name (string, no space)
Plant	plant name (string, no space)
Owner Name	owner name (string, no space)
Unit ID	unit ID (string, no space)
Bus No	bus number where the unit is located (long integer)
Min Capacity	minimum real power capacity (MW) (double)
Max Capacity	maximum real power capacity (MW) (double)
Min Capacity	minimum reactive power capacity (MVAR) (double)
Max Capacity	maximum reactive power capacity (MVAR) (double)
Wind Power Curve	curve index for the time series of wind power

There is a unique curve of wind unit: Wind Power Curve, which is a series of numbers showing the time series of the wind unit power generation percentage of maximum unit capacity. For

example, by clicking the hyperlink "2001", the following new page shows the wind power curve of Unit "W1". User can modify the series data for the curve by clicking the "Edit" button in front of each data record in the table and clicking the "Update" button to commit the changes.



3.4.3 Inputs – TRANSCOs Input

Go to *Home->Inputs ->TRANSCOs Input* to view the overall information of the TRANSCOs.

This page displays the list of TRANSCOs, and the statistic information about the numbers of branches that belong to each TRANSCO. The "Download Data" buttons allow a user to download the TRANSCOs related data listed in the table.

Owner	Number of Branches
TRANSCO1	58
TRANSCO2	49
TRANSCO3	34
TRANSCO4	53

Go to *Home->Inputs ->TRANSCOs Input->Buses* to view the detailed information on each bus of the system. Besides, by selecting the different items in the dropdown list on the top left of the buses table, a user can choose to display buses of individual TRANSCOs or all the buses. The "Download Data" button allows a user to download the detailed bus related data listed in the table. The "Add New Bus" button allows a user to add more buses to the current system. The "Edit" and "Delete" buttons in front of each existing bus record allow a user to edit or delete the chosen bus information. The "Edit" operation allows a user to edit the detailed information of the selected bus, while the "Delete" operation will delete the bus from the system.

	Name	Area Name	Zone Name	Owner Name	Bus No	Type	Base KV	Voltage Magnitude	Voltage Angle (deg.)	Gv	Bl	Min Voltage	Max Voltage	Status
Edit	BUS1	Area1	Zone1	TRANSCO1	1	0	12.00	0.96	-0.63	0.00	0.00	0.94	1.05	3
Edit	BUS2	Area1	Zone1	TRANSCO1	2	0	12.00	0.97	-0.49	0.00	0.00	0.95	1.06	3
Edit	BUS3	Area1	Zone1	TRANSCO1	3	0	12.00	0.97	-0.95	0.00	0.00	0.95	1.06	3
Edit	BUS4	Area1	Zone1	TRANSCO1	4	2	12.00	1.00	-7.46	0.00	0.00	0.99	1.09	1
Edit	BUS5	Area1	Zone1	TRANSCO1	5	0	12.00	1.00	-7.00	0.00	0.00	0.99	1.09	3
Edit	BUS6	Area1	Zone1	TRANSCO1	6	2	12.00	0.99	-0.36	0.00	0.00	0.97	1.10	1
Edit	BUS7	Area1	Zone1	TRANSCO1	7	0	12.00	0.99	-0.43	0.00	0.00	0.97	1.09	3
Edit	BUS8	Area1	Zone1	TRANSCO1	8	2	12.00	1.02	-3.85	0.00	0.00	0.98	1.09	1
Edit	BUS9	Area1	Zone1	TRANSCO1	9	0	12.00	1.00	0.03	0.00	0.00	0.98	1.09	3
Edit	BUS10	Area1	Zone1	TRANSCO1	10	2	12.00	1.05	-4.14	0.00	0.00	0.98	1.10	1

The description of individual columns of the bus table is as follows:

Name	bus name (character, maximum length 20, no space)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
Bus No	bus number (long integer)
Type	bus type (integer, only take the following numbers) <ul style="list-style-type: none"> 0: unregulated (load, PQ) 2: hold voltage within VAR limits (gen, PV) 3: hold voltage and angle (swing, V-Theta) 4: isolated
BaseKV	bus base voltage (kV) (double, non-negative)

Voltage Magnitude	bus voltage magnitude (p.u.) (double, non-negative)
Voltage Angle	bus voltage angle (degree) (double)
GL	shunt conductance (p.u.) (double)
BL	shunt susceptance (p.u.) (double)
Min Voltage Magnitude	minimum bus voltage magnitude (p.u.) (double, non-negative)
Max Voltage Magnitude	maximum bus voltage magnitude (p.u.) (double, non-negative)
Status	bus status (integer: 0 or 1)

Go to *Home->Inputs ->TRANSCOs Input->Branches* to view the detailed information on each branch of the system. Besides, by selecting the different items in the dropdown list on the top left of the branches table, a user can choose to display the branches of individual TRANSCOs or all the branches. The "Download Data" button allows a user to download the detailed branch related data listed in the table. The "Add New Branch" button allows a user to add more branches to the current system. The "Edit" and "Delete" buttons in front of each existing branch record allow a user to edit or delete the chosen branch information. The "Edit" operation allows a user to edit the detailed information of the selected branch, while the "Delete" operation will delete the branch from the system.

Name	Area Name	Zone Name	Owner Name	From Bus	To Bus	Circuit ID	Status	Resistance (p.u.)	Reactance (p.u.)	Charging (p.u.)	Rate A (p.u.)	Rate B (p.u.)	Rate C (p.u.)	Line Shunt I (A)	Line Shunt II (A)	Line Shunt III (A)	Line Shunt IV (A)
BR10	Areal	Zone1	TRANSC01	4	11	1	1	0.02	0.07	0.02	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR11	Areal	Zone1	TRANSC01	8	11	1	1	0.02	0.07	0.02	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR12	Areal	Zone1	TRANSC01	13	12	1	1	0.03	0.07	0.01	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR13	Areal	Zone1	TRANSC01	2	12	1	1	0.02	0.06	0.02	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR14	Areal	Zone1	TRANSC01	3	10	1	1	0.05	0.16	0.04	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR15	Areal	Zone1	TRANSC01	7	12	1	1	0.01	0.03	0.01	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR16	Areal	Zone1	TRANSC01	11	13	1	1	0.02	0.07	0.02	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR17	Areal	Zone1	TRANSC01	12	14	1	1	0.02	0.07	0.02	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR18	Areal	Zone1	TRANSC01	13	15	1	1	0.07	0.24	0.06	175.00	175.00	175.00	0.00	0.00	0.00	0.00
BR19	Areal	Zone1	TRANSC01	14	15	1	1	0.06	0.20	0.05	175.00	175.00	175.00	0.00	0.00	0.00	0.00

The description of individual columns of the branch table is as follows:

Name	branch name (character, maximum length 20, no space)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
From Bus (I)	from bus number (long integer)
To Bus (J)	to bus number (long integer)
Circuit ID (CID)	circuit ID (character, maximum length 2)
Status	branch status (integer: 0 or 1)
Resistance (R)	resistance (DEFAULT: 0; p.u.) (double)
Reactance (X)	reactance (DEFAULT: must input; p.u.) (double)
Charging (B)	total branch charging (DEFAULT: 0; p.u.) (double)

Rate A	long term rate, flow limit A (default: 0; MVA) (double)
Rate B	short term rate, flow limit B (default: 0; MVA) (double)
Rate C	emergency rate, flow limit C (default: 0; MVA) (double)
GI	line shunt conductance at from bus side (default: 0; p.u.) (double)
BI	line shunt susceptance at from bus side (default: 0; p.u.) (double)
GJ	line shunt conductance at to bus side (default: 0; p.u.) (double)
BJ	line shunt susceptance at to bus side (default: 0; p.u.) (double)
Length	branch length (default: 0) (double)

Go to *Home->Inputs ->TRANSCOs Input->Transformers* to view the detailed information on each transformer of the system. Besides, by selecting the different items in the dropdown list on the top left of the transformers table, a user can choose to display each individual TRANSCO's transformer list or all the transformers. The "Download Data" button allows a user to download the detailed transformer related data listed in the table. The "Add New Transformer" button allows a user to add more transformers to the current system. The "Edit" and "Delete" buttons in front of each existing transformer record allow a user to edit or delete the chosen transformer information. The "Edit" operation allows a user to edit the detailed information of the selected transformer, while the "Delete" operation will delete the transformer from the system.

	Name	Area Name	Zone Name	Owner Name	From Bus	To Bus	Circuit ID	Type	Resistance (R)	Reactance (X)	Rate A (MVA)	Rate B (MVA)	Rate C (MVA)	Turns Ratio	Phase Shifter (deg.)	IAPMEN	IAPMAS	ANG
Edit	TF1	Area1	Zone1	TRANSCO1	8	9	1	1	0.00	0.03	500.00	500.00	500.00	0.99	0.00	0.00	0.00	0
Edit	TF2	Area1	Zone1	TRANSCO1	26	25	1	1	0.00	0.04	500.00	500.00	500.00	0.98	0.00	0.00	0.00	0
Edit	TF3	Area1	Zone1	TRANSCO1	30	17	1	1	0.00	0.04	500.00	500.00	500.00	0.98	0.00	0.00	0.00	0
Edit	TF4	Area1	Zone2	TRANSCO1	36	37	1	1	0.00	0.04	500.00	500.00	500.00	0.94	0.00	0.00	0.00	0
Edit	TF5	Area2	Zone2	TRANSCO3	63	59	1	1	0.00	0.04	500.00	500.00	500.00	0.96	0.00	0.00	0.00	0
Edit	TF6	Area2	Zone2	TRANSCO3	64	61	1	1	0.00	0.03	500.00	500.00	500.00	0.95	0.00	0.00	0.00	0
Edit	TF7	Area2	Zone2	TRANSCO3	65	66	1	1	0.00	0.04	500.00	500.00	500.00	0.94	0.00	0.00	0.00	0
Edit	TF8	Area2	Zone2	TRANSCO3	68	69	1	1	0.00	0.04	500.00	500.00	500.00	0.94	0.00	0.00	0.00	0
Edit	TF9	Area2	Zone2	TRANSCO4	81	80	1	4	0.00	0.04	500.00	500.00	500.00	0.94	3.57	0.00	0.00	-1°

The description of individual columns of the transformer table is as follows:

Name	transformer name (character, maximum length 20, no space)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
From Bus (I)	from bus number (long integer)
To Bus (J)	to bus number (long integer)
Circuit ID (CID)	circuit ID (character, maximum length 2)
Type	transformer type (integer: 1: Tap changer, 4: Phase shifter)
Resistance (R)	resistance (DEAFULT: 0; p.u.) (double)
Reactance (X)	reactance (DEAFULT: must input; p.u.) (double)
Charging (B)	total branch charging (DEAFULT: 0; p.u.) (double)
Rate A	long term rate, flow limit A (default: 0; MVA) (double)

Rate B	short term rate, flow limit B (default: 0; MVA) (double)
Rate C	emergency rate, flow limit C (default: 0; MVA) (double)
Turns Ratio	fixed tap (default: 1; p.u.) (double)
Phase Shift	fixed phase shifter angle (default: 0; degree) (double)
TAPMIN	minimum tap change (double)
TAPMAX	maximum tap change (double)
ANGLEMIN	minimum phase shifter angle (double)
ANGLEMAX	maximum phase shifter angle (double)

Go to *Home->Inputs ->TRANSCOs Input->Shunt Elements* to view the detailed information on each shunt element of the system. Besides, by selecting the different items in the dropdown list on the top left of the shunt elements table, a user can choose to display the shunt elements of individual TRANSCOs or all the shunt elements. The "Download Data" button allows a user to download the detailed shunts related data listed in the table. The "Add New Shunt" button allows a user to add more shunts to the current system. The "Edit" and "Delete" buttons in front of each existing shunt element record allow a user to edit or delete the chosen shunt information. The "Edit" operation allows a user to edit the detailed information of the selected shunt, while the "Delete" operation will delete the shunt from the system.

Name	Type	Area Name	Zone Name	Owner Name	ID	Bus No	Status	Q (MVAR)	Min Q (MVAR)	Max Q (MVAR)
Edit Delete S01	Inductor	Area2	Zone1	TRANSC01	1	5	1	-46.00	-90.00	0.00
Edit Delete S02	Capacitor	Area2	Zone2	TRANSC02	1	34	1	14.00	0.00	28.00
Edit Delete S03	Inductor	Area2	Zone2	TRANSC02	1	37	1	-25.00	-30.00	0.00
Edit Delete S04	Capacitor	Area2	Zone2	TRANSC02	1	44	1	16.00	0.00	28.00
Edit Delete S05	Capacitor	Area2	Zone2	TRANSC02	1	45	1	16.00	0.00	28.00
Edit Delete S06	Capacitor	Area2	Zone2	TRANSC02	1	46	1	16.00	0.00	28.00
Edit Delete S07	Capacitor	Area2	Zone2	TRANSC02	1	48	1	15.00	0.00	28.00
Edit Delete S08	Capacitor	Area1	Zone1	TRANSC03	1	74	1	12.00	0.00	29.00
Edit Delete S09	Capacitor	Area2	Zone2	TRANSC04	1	79	1	10.00	0.00	30.00
Edit Delete S010	Capacitor	Area3	Zone3	TRANSC04	1	82	1	10.00	0.00	30.00

The description of individual columns of the shunt elements table is as follows:

Name	shunt element name (character, maximum length 20, no space)
Type	transformer type (string: Capacitor or Inductor)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
ID	shunt element ID (character, maximum length 2)
BusNo	shunt element bus number (long integer)
Status	shunt element status (integer: 0 or 1)
Q	initial shunt capacitance (default: 0; MVAR) (double)
Min Q	minimum shunt capacitance (default: 0; MVAR) (double)
Max Q	maximum shunt capacitance (default: 0; MVAR) (double)

Go to *Home->Inputs->TRANSCOs Input->HVDC->Current Source Converter* to view the detailed information on each current source converter (CSC) of the HVDC lines of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC table, a user can choose to display the CSCs of individual TRANSCOs or all the CSCs. The "Download Data" button allows a user to download the detailed CSC related data listed in the table. The "New Current Source Converter" button allows a user to add more CSCs to the current system. The "Edit" and "Delete" buttons in front of each existing CSC record allow a user to edit or delete the chosen CSC information. The "Edit" operation allows a user to edit the detailed information of the selected CSC, while the "Delete" operation will delete the CSC from the system.

Name	Area Name	Zone Name	Owner Name	Group Name	Type	ACBusNo	DCBusA No	DCBusB No	Status	MODE	SELVL	SB	EC	XC	ANGHS	
COVTL	Area1	Zones1	TRANSCO_DC	DCGROUP6	1	113	17	-1	1	1	2.00	1	0.00	0.00	20.00	-8.00
COVTR	Area1	Zones1	TRANSCO_DC	DCGROUP6	2	32	-5	10	1	1	1.95	1	0.00	0.00	20.00	5.00

The description of individual columns of the CSC table is as follows:

Name	current source converter name (string)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
Group Name	group name of HVDC lines (string)
Type	CSC type (integer, 1 or 2; 1: Rectifier; 2: Inverter)
ACBusNo	AC bus number of the CSC connected to (long integer)
DCBusA No	DC bus A number of the CSC connected to (long integer)
DCBusB No	DC bus B number of the CSC connected to (long integer)
Status	CSC status (integer: 0 or 1)
MODE	CSC control mode 1 (integer: 0 to 3; 0: blocked; 1: constant DC current; 2: constant power; 3: constant DC voltage)

SELVL	CSC set point for control mode 1 (double)
NB	Number of converter bridges (integer)
RC	Commutating resistance per bridge (double, p.u.)
XC	Commutating reactance per bridge (double, p.u.)
ANG	CSC firing angle (double, degree, default: 15)
ANGMN	CSC minimum firing angle (double, degree, default: 10)
ANGMX	CSC maximum firing angle (double, degree, default: 25)
Turns Ratio	CSC transformer off-nominal turns ratio (double, p.u., default: 1)
TAPMIN	CSC minimum transformer off-nominal turns ratio (double, p.u., default: 0.51)
TAPMAX	CSC maximum transformer off-nominal turns ratio (double, p.u., default: 1.50)
MODE2	CSC control mode 2 (integer: 0 to 3; 0: blocked; 1: constant DC current; 2: constant power; 3: constant DC voltage)
SELVL2	CSC set point for control mode 2 (double)
Min Capacity	CSC minimum real power capacity (double, MW)
Max Capacity	CSC maximum real power capacity (double, MW)
Min Capacity	CSC minimum reactive power capacity (double, MVAR)
Max Capacity	CSC maximum reactive power capacity (double, MVAR)
DC Min Current	CSC minimum DC current limit (double, p.u.)
DC Max Current	CSC maximum DC current limit (double, p.u.)

Go to *Home->Inputs->TRANSCOs Input->HVDC->Voltage Source Converter* to view the detailed information on each voltage source converter (VSC) of the HVDC lines of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC table, a user can choose to display the VSCs of individual TRANSCOs or all the VSCs. The "Download Data" button allows a user to download the detailed VSC related data listed in the table. The "New Voltage Source Converter" button allows a user to add more VSCs to the current system. The "Edit" and "Delete" buttons in front of each existing VSC record allow a user to edit or delete the chosen VSC information. The "Edit" operation allows a user to edit the detailed information of the selected VSC, while the "Delete" operation will delete the VSC from the system.

	Name	Area Name	Zone Name	Owner Name	Group Name	Type	ACBusNo	DCBusANo	DCBusBNo	Status	Mode	SELVL1	SELVL2	Reactance (m.u.)	MVA Capacity (MW)
Edit	VSC1	Area1	Zone1	TRANSCO_DC	DCGROUP1	1	23	-5	-1	1	2	0.00	0.00	0.02	-2.00
Edit	VSC2	Area1	Zone1	TRANSCO_DC	DCGROUP1	1	24	2	-1	1	1	0.00	1.00	0.02	-2.00
Edit	VSC3	Area1	Zone1	TRANSCO_DC	DCGROUP2	2	47	-5	2	1	2	0.00	0.00	0.02	-2.00
Edit	VSC4	Area1	Zone1	TRANSCO_DC	DCGROUP2	1	69	4	-1	1	2	0.00	1.00	0.02	-2.00
Edit	VSC5	Area1	Zone1	TRANSCO_DC	DCGROUP3	1	49	-5	1	1	2	0.00	0.00	0.02	-2.00
Edit	VSC6	Area1	Zone1	TRANSCO_DC	DCGROUP3	1	69	8	-1	1	1	0.00	1.00	0.02	-2.00
Edit	VSC7	Area1	Zone1	TRANSCO_DC	DCGROUP4	2	65	-5	7	1	2	0.00	0.00	0.02	-2.00
Edit	VSC8	Area1	Zone1	TRANSCO_DC	DCGROUP4	1	68	8	-1	1	1	0.00	1.00	0.02	-2.00
Edit	VSC9	Area1	Zone1	TRANSCO_DC	DCGROUP5	2	18	-5	9	1	2	0.00	0.00	0.02	-1.00
Edit	VSC10	Area1	Zone1	TRANSCO_DC	DCGROUP5	1	201	10	-1	1	2	0.00	0.00	0.01	-1.00

The description of individual columns of the VSC table is as follows:

Name	voltage source converter name (string)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
Group Name	group name of HVDC lines (string)
Type	VSC type (integer, 1 or 2; 1: Rectifier; 2: Inverter)
ACBusNo	AC bus number of the VSC connected to (long integer)
DCBusANo	DC bus number A of the VSC connected to (long integer)
DCBusBNo	DC bus number B of the VSC connected to (long integer)
Status	VSC status (integer: 0 or 1)

MODE	VSC control mode (integer, 1: PQ; 2: PV)
SELVL1	VSC set point for control mode 1 (double)
SELVL2	VSC set point for control mode 2 (double)
Reactance	VSC coupling transformer reactance (double, p.u.)
Min Capacity	VSC minimum real power capacity (double, MW)
Max Capacity	VSC maximum real power capacity (double, MW)
Min Capacity	VSC minimum reactive power capacity (double, MVAR)
Max Capacity	VSC maximum reactive power capacity (double, MVAR)
EACMIN	VSC minimum AC voltage (double, p.u., default: 0.95)
EACMAX	VSC maximum AC voltage (double, p.u., default: 1.05)
DC Min Current	VSC minimum DC current limit (double, p.u.)
DC Max Current	VSC maximum DC current limit (double, p.u.)

Go to *Home->Inputs->TRANSCOs Input->HVDC->DC Buses* to view the detailed information on each DC bus of the system. Besides, by selecting the different items in the dropdown list on the top left of the DC bus table, a user can choose to display the DC buses of individual TRANSCOs or all the DC buses. The "Download Data" button allows a user to download the detailed DC bus related data listed in the table. The "Add New Bus" button allows a user to add more DC buses to the current system. The "Edit" and "Delete" buttons in front of each existing DC bus record allow a user to edit or delete the chosen DC bus information. The "Edit" operation allows a user to edit the detailed information of the selected DC bus, while the "Delete" operation will delete the DC bus from the system.

	Name	Area Name	Zone Name	Owner Name	Group Name	Bus No	Type	R Ground	Voltage Magnitude (p.u.)	Min Voltage Magnitude (p.u.)	Max Voltage Magnitude (p.u.)
Edit	DCBUS1	Area1	Zone1	TRANSCO_DC	DCGROUP1	1	3	0.00	1.00	0.90	1.15
Edit	DCBUS2	Area1	Zone1	TRANSCO_DC	DCGROUP1	2	1	0.00	1.00	0.90	1.15
Edit	DCBUS3	Area1	Zone1	TRANSCO_DC	DCGROUP2	3	3	0.00	1.00	0.90	1.15
Edit	DCBUS4	Area1	Zone1	TRANSCO_DC	DCGROUP2	4	1	0.00	1.00	0.90	1.15
Edit	DCBUS5	Area1	Zone1	TRANSCO_DC	DCGROUP3	5	3	0.00	1.00	0.90	1.15
Edit	DCBUS6	Area1	Zone1	TRANSCO_DC	DCGROUP3	6	1	0.00	1.00	0.90	1.15
Edit	DCBUS7	Area1	Zone1	TRANSCO_DC	DCGROUP4	7	3	0.00	1.00	0.90	1.15
Edit	DCBUS8	Area1	Zone1	TRANSCO_DC	DCGROUP4	8	1	0.00	1.00	0.90	1.15
Edit	DCBUS9	Area1	Zone1	TRANSCO_DC	DCGROUP5	9	3	0.00	1.00	0.85	1.20
Edit	DCBUS10	Area1	Zone1	TRANSCO_DC	DCGROUP5	10	1	0.00	1.00	0.90	1.20

The description of individual columns of the DC bus table is as follows:

Name	DC bus name (string)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
Group Name	group name of HVDC lines (string)
BusNo	DC bus number (long integer)
Type	DC bus type (integer, 3 for swing bus that balances losses in the DC network)
R Ground	resistance to ground (double)
Voltage Magnitude	DC bus voltage magnitude (double, p.u.)
Min Voltage Magnitude	minimum DC bus voltage magnitude (double, p.u.)
Max Voltage Magnitude	maximum DC bus voltage magnitude (double, p.u.)

Go to *Home->Inputs->TRANSCOs Input->HVDC->DC Branches* to view the detailed information on each DC branch of the system. Besides, by selecting the different items in the dropdown list on the top left of the DC branch table, a user can choose to display the DC branches of individual TRANSCOs or all the DC branches. The "Download Data" button allows a user to download the detailed DC branch related data listed in the table. The "Add New Branch" button allows a user to add more DC branches to the current system. The "Edit" and "Delete" buttons in front of each existing DC branch record allow a user to edit or delete the chosen DC branch information. The "Edit" operation allows a user to edit the detailed information of the selected DC branch, while the "Delete" operation will delete the DC branch from the system.

	Name	Area Name	Zone Name	Owner Name	Group Name	IDC	JDC	Circuit ID	Status	Resistance (R)	Rate A (MW)	Rate B (MW)	Rate C (MW)
Edit	DCBRANCH1	Areal	Zone1	TRANSCO_DC	DCGROUP1	1	2	1	1	0.0E	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH2	Areal	Zone1	TRANSCO_DC	DCGROUP2	2	4	1	1	0.0E	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH3	Areal	Zone1	TRANSCO_DC	DCGROUP3	3	6	1	1	0.0E	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH4	Areal	Zone1	TRANSCO_DC	DCGROUP4	7	8	1	1	0.0E	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH5	Areal	Zone1	TRANSCO_DC	DCGROUP5	9	10	1	1	0.0E	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH6	Areal	Zone1	TRANSCO_DC	DCGROUP6	10	11	1	1	0.00	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH7	Areal	Zone1	TRANSCO_DC	DCGROUP7	11	12	1	1	0.00	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH8	Areal	Zone1	TRANSCO_DC	DCGROUP8	11	13	1	1	0.00	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH9	Areal	Zone1	TRANSCO_DC	DCGROUP9	13	14	1	1	0.00	1,000.00	1,000.00	1,000.00
Edit	DCBRANCH10	Areal	Zone1	TRANSCO_DC	DCGROUP10	13	15	1	1	0.01	1,000.00	1,000.00	1,000.00

The description of individual columns of the DC branch table is as follows:

Name	DC branch name (string)
Area Name	area name (string)
Zone Name	zone name (string)
Owner Name	owner name (string)
Group Name	group name of HVDC lines (string)
IDC	from DC bus number (long integer)
JDC	to DC bus number (long integer)
Circuit ID	circuit ID (character, maximum length 2)
Status	DC branch status (integer: 0 or 1)
Resistance (R)	DC branch resistance (double)

Rate A

flow limit A for long term rating (default: 0; MVA) (double)

Rate B

flow limit B for short term rating (default: 0; MVA) (double)

Rate C

flow limit C for emergency rating (default: 0; MVA) (double)

3.4.4 Inputs – DISCOs Input

Go to *Home->Inputs ->DISCOs Input* to view the overall information of the DISCOs.

This page displays the list of DISCOs, and the statistic information about the numbers of loads that belong to each DISCO. The "Download Data" button allows a user to download the DISCOs related data listed in the table.

Owner	number of load
DISTC01	29
DISTC02	29
DISTC03	29
DISTC04	28
DISTC05	5
DISTC06	6

Go to *Home->Inputs ->DISCOs Input->Load Distribution* to view the detailed information on each load of the system. Besides, by selecting the different items in the dropdown list on the top left of the loads table, a user can choose to display the loads of individual DISCOs or all the loads. The "Download Data" button allows a user to download the detailed load related data listed in the table. The "Add New Load" button allows a user to add more loads to the current system. The "Edit" and "Delete" buttons in front of each existing load record allow a user to edit or delete the chosen load information. The "Edit" operation allows a user to edit the detailed information of the selected load, while the "Delete" operation will delete the load from the system.

Name	Area Name	Zone Name	Owner Name	ID	Bus No	Status	PL(MW)	PL%	QL(MVAR)	QL%
load1	Area1	Zone1	DISTC01	1	1	1	54.34	1.45	0.46	0.40
load2	Area1	Zone1	DISTC01	1	2	1	21.23	0.87	9.55	0.66
load3	Area1	Zone1	DISTC01	1	3	1	41.40	1.31	10.61	0.74
load4	Area1	Zone1	DISTC01	1	4	1	31.05	0.85	12.74	0.60
load5	Area1	Zone1	DISTC01	1	5	1	65.20	1.48	23.95	1.62
load6	Area1	Zone1	DISTC01	1	6	1	28.17	0.84	1.12	0.15
load7	Area1	Zone1	DISTC01	1	11	1	74.21	1.99	24.42	1.69
load8	Area1	Zone1	DISTC01	1	12	1	49.89	1.34	10.62	0.74
load9	Area1	Zone1	DISTC01	1	13	1	36.09	0.97	16.99	1.18
load10	Area1	Zone1	DISTC01	1	14	1	14.86	0.40	1.08	0.47

The description of individual columns of the load table is as follows:

Name load name (character, maximum length 20, no space)

Area Name area name (string)

Zone Name zone name (string)

Owner Name owner name (string)

ID load ID (character, maximum length 2)

Bus No bus number (long integer)

Status status (integer: 0 or 1)

PL constant power MW load (default: 0; MW) (double)

PL% percentage of PL over total load (double)

QL constant power MVAR load (default: 0; MVAR) (double)

QL% percentage of QL over total load (double)

Go to *Home->Inputs ->DISCOs Input->24 Hours Load* to view detailed hourly load information of each load of the system.

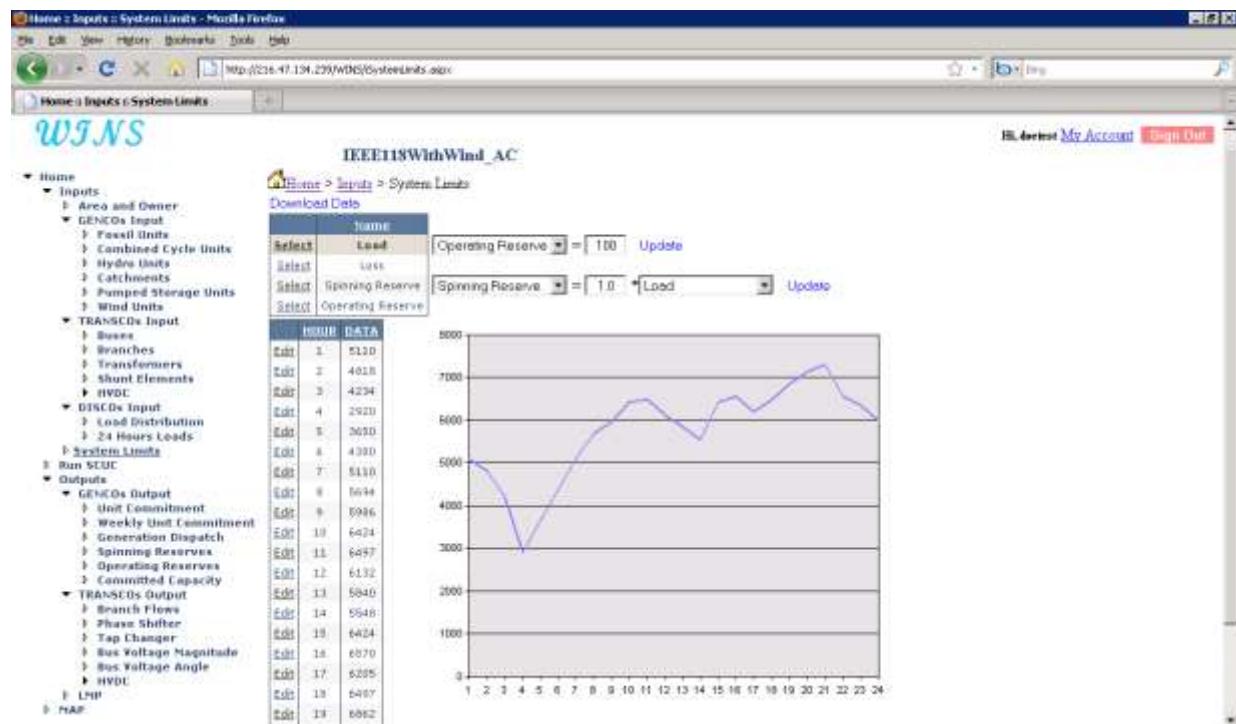
Bus	Bus ID	Owner	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18
Load1	1	DESTCO1	74.10	69.87	61.40	42.34	52.93	62.82	74.10	62.87	66.81	93.16	94.22	88.93	84.89	80.46	93.16	86.28	89.98	94.1
Load2	2	DESTCO1	29.04	27.40	24.07	18.60	20.75	24.90	29.06	32.38	34.04	36.55	36.94	34.87	31.21	21.55	36.55	37.36	39.28	36.7
Load3	3	DESTCO1	56.67	53.43	48.95	32.38	40.47	48.57	56.67	63.34	66.38	71.24	72.08	68	64.76	61.52	71.24	72.08	68.81	72.1
Load4	4	DESTCO1	43.99	41.10	36.12	24.81	31.14	37.36	43.99	48.38	51.07	64.80	55.93	52.31	49.82	47.33	54.89	56.05	52.94	55.2
Load5	5	DESTCO1	79.58	71.24	62.60	43.17	53.97	64.39	79.56	84.19	88.81	94.93	96.00	90.67	86.35	82.03	94.93	87.14	91.78	96.3
Load6	6	DESTCO1	27.46	26.03	22.87	15.77	19.72	25.68	27.46	30.76	32.34	34.70	35.10	33.15	31.85	29.97	34.70	35.49	33.52	35.2
Load7	7	DESTCO1	27.46	26.03	22.87	15.77	19.72	25.68	27.46	30.76	32.34	34.70	35.10	33.15	31.85	29.97	34.70	35.49	33.52	35.2
Load8	8	DESTCO1	101.71	95.90	84.28	58.32	72.85	87.18	101.71	113.34	119.15	127.87	128.32	122.06	118.25	110.43	127.87	139.78	122.51	129.
Load9	9	DESTCO1	68.29	54.38	58.58	73.02	48.77	55.53	68.29	70.28	79.88	85.85	86.82	81.35	78.84	74.14	85.85	87.88	82.32	88.2
Load10	10	DESTCO1	49.46	46.57	40.93	28.22	35.28	42.34	49.46	55.04	57.87	62.10	62.31	59.28	56.45	53.83	62.10	63.31	59.98	62.3
Load11	11	DESTCO1	20.34	19.17	16.85	11.62	14.51	17.43	20.34	22.66	23.82	25.57	25.86	24.40	23.24	22.06	25.57	26.15	24.69	25.2
Load12	12	DESTCO1	20.34	19.17	16.85	11.62	14.51	17.43	20.34	22.66	23.82	25.57	25.86	24.40	23.24	22.06	25.57	26.15	24.69	25.2

3.4.5 Inputs – System Limits

Go to *Home->Inputs ->System Limits* to view limits on system load, system loss, and system reserve. A user can set the values for each system limit or define the simple linear relationship between each individual system limits using the functions on the right of the system limit table.

	name
Select	Load: 100
Select	Load: 1.0
Select	Operating Reserve: 1.0
Select	Operating Reserve: 1.0

A user can also directly change hourly load, loss, spinning reserve, and operating reserve in the corresponding tables by clicking the "Select" button in front of each system limit. For example, the following page shows the 24 hours load limit by clicking the "Select" button in front of "Load". "Edit" button in front of each hourly load limit allow a user to edit the chosen load limit.



3.5 Execute SCUC

Go to *Home->Inputs ->Run SCUC* to view all the control parameters used to execute the SCUC program. "Edit" button in front of each parameter allows a user to change the value of the chosen parameter. Click the "Run SCUC" button to execute SCUC. And the whole process is divided into three sub-processes.

- 1) "SCUC.exe" retrieves the input data from oracle database.
- 2) "SCUC.exe" executes the SCUC core algorithm and calculates the optimization results.
- 3) "SCUC.exe" writes the results back to the oracle database.

Parameter	Value	Description
Edit LMSTEF	1.20	Lagrangian multipliers update step
Edit EDRAHF	1	consider ramping constraint in economic dispatch or not
Edit EDRESERVE	1	consider reserve constraint in economic dispatch or not
Edit INIWW	1	consider initial MW value in UC and ED or not
Edit MAXRDG	0.0020	relative duality gap limit
Edit MAHCTER	100	maximum UC iteration number
Edit MAXUCITERCUT	10	maximum cut iteration number in the UC phase
Edit MAXEDITERCUT	10	maximum cut iteration number in the ED phase
Edit ACSTROW	2	network constraint (0: no network constraint; 1: DC; 2: AC)
Edit MVABASE	100	MVA base value

It may take several minutes to run SCUC. Do not refresh your internet browser. Please wait... [Run SCUC](#)

3.6 Outputs

Through the TreeView, under "Outputs" node, a user can view and download result of all modules of WINS.

- GENCOs, TRANSCOs Output: output results related to market participants (GENCOs and TRANSCOs)
- LMP: hourly locational marginal prices

3.6.1 Outputs – GENCOs Output

Go to *Home ->Outputs ->GENCOs Output -> Unit Commitment* to view the detailed hourly commitment status of each unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the unit commitment table, a user can choose to display the unit commitment results of individual GENCOs or all GENCOs. The "Download Data" button allows a user to download the detailed unit commitment results listed in the table.

Unit Index	Unit Name	Commit Type	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24	OWNERID
1001	TG1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1002	TG2	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1003	TG3	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1004	TG4	T	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1005	TG5	T	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1006	TG6	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1007	TG7	T	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1008	TG8	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1009	TG9	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1010	TG10	T	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

Go to *Home -> Outputs -> GENCOs Output -> Generation Dispatch* to view the detailed hourly generation dispatch of each unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the unit generation dispatch table, a user can choose to display the unit generation dispatch results of individual GENCOs or all GENCOs. The "Download Data" button allows a user to download the detailed unit generation dispatch results listed in the table.

Unit	Tag	Unit Status	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24
1E01	TQ1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1E02	TQ2	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1E03	TQ3	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1E04	TQ4	T	240	180	150	150	150	150	240	270	300	300	264.62	270	270	300	300	300	300	300	300	300	300	300	300	
1E05	TQ5	T	236.09	180	179.99	180	180	140	220	260	280	300	300	300	300	300	300	300	300	300	300	300	300	300		
1E06	TQ6	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1E07	TQ7	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1E08	TQ8	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1E09	TQ9	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1E10	TQ10	T	140	180	180	100	100	179.99	220	260	280	260	260	260	260	300	300	300	300	300	300	300	300	300		

Go to *Home->Outputs -> GENCOs Output->Spinning Reserve* to view the detailed hourly spinning reserve of each unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the spinning reserve table, a user can choose to display the unit spinning reserve results of individual GENCOs or all GENCOs. The "Download Data" button allows a user to download the detailed unit spinning reserve results listed in the table.

Go to *Home->Outputs -> GENCOs Output->Operating Reserve* to view the detailed hourly operating reserve of each unit of the system. Besides, by selecting the different items in the dropdown list on the top left of the operating reserve table, a user can choose to display the unit operating reserve results of individual GENCOs or all GENCOs. The "Download Data" button allows a user to download the detailed unit operating reserve results listed in the table.

Unit Index	Unit Name	Unit Type	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24	GENCO ID
1001	TG1	T	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	3
1002	TG2	T	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	3
1003	TG3	T	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	1
1004	TG4	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
1005	TG5	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
1006	TG6	T	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	2
1007	TG7	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1008	TG8	T	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	1
1009	TG9	T	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	4
1010	TG10	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Go to *Home -> Outputs -> GENCOs Output -> Committed Capacity* to view the detailed hourly committed capacity of each unit of the system. When one unit is scheduled ON in the current hour, its committed capacity is equal to its generation capacity in the current hour; otherwise, its committed capacity is equal to zero in the current hour. Besides, by selecting the different items in the dropdown list on the top left of the committed capacity table, a user can choose to display the unit committed capacity results of individual GENCOs or all GENCOs. The "Download Data" button allows a user to download the detailed unit committed capacity results listed in the table.

Unit Index	Unit Name	Unit Type	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24
1001	TG1	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1002	TG2	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1003	TG3	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1004	TG4	T	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	
1005	TG5	T	300	300	300	300	200	500	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	
1006	TG6	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1007	TG7	T	0	0	0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
1008	TG8	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1009	TG9	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1010	TG10	T	300	300	300	300	200	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	

3.6.2 Outputs – TRANSCOs Output

Go to *Home -> Outputs -> TRANSCOs Output -> Branch Flows* to view the detailed hourly flow of each branch of the system. Besides, by selecting the different items in the dropdown list on the top left of the branch flow table, a user can choose to display the branch flow results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed branch flow results listed in the table.

Name	From Bus	To Bus	Circuit ID	Rate k (MW)	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	
B1	1	2	1	175	-26.45	-24.95	-22.94	-24.29	-17.56	-23.72	-27.43	-31.49	-33.08	-26.13	-26.41	-34.88	-35.80	-30.78	-2
B2	1	1	1	175	-45.65	-44.82	-38.45	-28.05	-25.35	-41.79	-46.87	-51.08	-53.74	-57.82	-57.81	-54.04	-58.88	-49.87	-5
B3	4	5	1	300	-93.24	-93.32	-78.61	-59.88	-25.26	-88.28	-96.81	-154.05	-109.24	-115.00	-116.85	-108.77	-151.53	-121.58	-3
B4	3	5	1	175	-74.64	-74.88	-63.21	-47.13	-59.82	-70.08	-77.07	-82.73	-88.18	-93.36	-94.42	-67.93	-82.44	-81.48	-6
B5	5	6	1	175	88.64	84.03	69.79	54.27	69.68	60.33	88.68	91.27	98.46	100.34	102.04	94.34	87.38	88.83	31
B6	6	7	1	175	4.33	11.99	6.66	10.72	14.88	14.81	9.21	6.12	6.74	4.07	4.68	2.53	-6.03	5.79	-
B7	8	9	1	300	-237.37	-176.40	-148.75	-148.64	-148.65	-148.75	-237.03	-246.71	-264.43	-295.61	-295.66	-299.43	-264.48	-264.50	-2
B8	8	5	1	500	211.14	317.69	265.07	204.27	268.57	301.76	336.07	349.24	367.93	386.69	381.94	383.84	337.54	340.63	31
B9	9	10	1	500	-238.69	-179.25	-149.37	-149.19	-149.15	-149.50	-238.39	-240.39	-260.21	-247.99	-297.95	-291.59	-280.16	-266.57	-2
B10	4	11	1	175	49.64	52.41	42.51	34.96	44.02	60.89	93.01	95.47	98.17	90.27	61.42	56.49	51.76	54.29	8

Go to *Home -> Outputs -> TRANSCOs Output -> Phase Shifter* to view the detailed hourly phase shift of phase shifter of the system. Besides, by selecting the different items in the dropdown list on the top left of the phase shifter table, a user can choose to display the phase shift results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed phase shift results listed in the table.

The screenshot shows a web browser window for Mozilla Firefox displaying the WINS software interface. The URL is <http://216.47.134.23/WINS/Outputs/PhaseShR.aspx>. The page title is "IEEE118WithWind_AC". The left sidebar has a tree menu with "Home" expanded, showing "Inputs" (Area and Owner, GENCOs Input, TRANSCOs Input: Buses, Branches, Transformers, Shunt Elements, and svnu). The main content area shows a table titled "All TransCos" with a "Download Data" button. The table has columns for Name, From Bus, To Bus, Circuit ID, H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, H12, H13, H14, H15, H16, H17, H18, H19, H20, H21, H22, and H23. The data in the table is as follows:

Name	From Bus	To Bus	Circuit ID	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23
TNU	85	86	1	-1.39	2.75	1.90	5.80	-12.87	-5.17	9.32	9.49	9.32	9	8.37	8.50	14	4.83	6	9	9.56	9.50	9	2.55	2.87	8	-10.8

Go to *Home -> Outputs -> TRANSCOs Output -> Tap Changer* to view the detailed hourly turn ratios of transformers of the system. Besides, by selecting the different items in the dropdown list on the top left of the tap changer table, a user can choose to display the tap changer results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed tap changer results listed in the table.

Go to *Home -> Outputs -> TRANSCOs Output -> Bus Voltage Magnitude* to view the detailed hourly voltage magnitudes of buses of the system. Besides, by selecting the different items in the dropdown list on the top left of the bus voltage magnitude table, a user can choose to display the bus voltage magnitude results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed bus voltage magnitude results listed in the table.

The screenshot shows the WINS software interface with the following details:

- Header:** Home > Outputs > TRANSCOs Output > Bus Voltage Magnitude
- Table Headers:** BUS# ID, NAME, LOWERLIMIT, UPPERLIMIT, H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, H12, H13, H14, H15
- Data Rows:** There are 118 rows, each representing a bus. The first few rows are:

BUS#	ID	NAME	LOWERLIMIT	UPPERLIMIT	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15
1	BUS1		0.94	1.05	1.0154	1.0114	0.9828	0.9682	0.9418	1.0095	0.9563	1.0031	0.94	0.9401	0.9404	0.94	0.9422	0.9450	0.95
2	BUS2		0.95	1.06	1.0253	1.0218	0.9938	0.9746	0.9705	1.0183	0.9497	1.0171	0.9550	0.9564	0.9587	0.9564	0.9583	0.9601	0.95
3	BUS3		0.95	1.06	1.0223	1.0201	0.99	0.9734	0.9804	1.0176	0.9455	1.0130	0.9512	0.9525	0.9531	0.9514	0.9529	0.9551	0.95
4	BUS4		0.99	1.09	1.0525	1.0498	1.0129	0.99	0.99	1.0451	0.9867	1.0468	0.9910	0.9973	0.9991	0.9919	0.99	0.99	0.99
5	BUS5		0.99	1.09	1.0561	1.0531	1.0156	0.9919	0.9924	1.0405	1.0002	1.0306	0.9463	1.0022	1.0041	0.9963	0.9940	0.9938	1.03
6	BUS6		0.97	1.09	1.0363	1.0331	1.0011	0.9803	0.9779	1.0291	0.9800	1.0192	0.9705	0.9739	0.9748	0.9713	0.9734	0.9723	0.97
7	BUS7		0.97	1.09	1.0305	1.0347	1.0009	0.9817	0.9799	1.0302	0.9836	1.0321	0.9796	0.9763	0.9771	0.9745	0.9749	0.9756	0.97
8	BUS8		0.99	1.09	1.0524	1.0596	1.0198	0.9996	1.0008	1.0540	1.0060	1.0381	1.0893	1.0723	1.0257	1.0109	1.0052	1.0026	1.02
9	BUS9		0.99	1.09	1.09	1.09	1.0193	1.0095	1.0110	1.09	1.0204	1.09	1.0367	1.0687	1.0706	1.0421	1.0308	1.0274	1.09
10	BUS10		0.98	1.09	1.0816	1.0825	1.0221	0.9835	0.9851	1.0877	1.0329	1.0870	1.0322	1.0837	1.0425	1.0250	1.0209	1.07	

Go to *Home -> Outputs -> TRANSCOs Output -> Bus Voltage Angle* to view the detailed hourly voltage angles of buses of the system. Besides, by selecting the different items in the dropdown list on the top left of the bus voltage angle table, a user can choose to display the bus voltage angle results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed bus voltage angle results listed in the table.

BUS NO	BUS NAME	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20
1	BUS1	-29.65	-35.96	-29.29	-15.44	-28.15	-37.67	-31.66	-28.25	-32.97	-15.26	-36.84	-32.01	-30.67	-31.64	-34.99	-34.76	-32.91	-34.74	-39.58	-42.
2	BUS2	-29.13	-34.61	-28.01	-15.61	-27.13	-36.63	-30.24	-27.55	-30.99	-15.01	-34.39	-29.87	-28.93	-29.78	-32.76	-32.49	-30.71	-32.48	-37.21	-40.
3	BUS3	-29.83	-34.34	-28.57	-15.76	-27.20	-36.92	-30.68	-28.09	-31.58	-13.71	-35.16	-30.81	-29.23	-30.38	-33.82	-33.29	-31.49	-33.28	-39.01	-41.
4	BUS4	-24.87	-31.15	-24.90	-13.06	-21.05	-33.35	-28.31	-23.79	-28.51	-28.51	-29.81	-25.56	-24.51	-25.67	-26.24	-27.98	-26.37	-27.91	-32.39	-35.
5	BUS5	-24.51	-30.79	-24.57	-12.79	-23.51	-33.01	-25.89	-23.39	-28.03	-26.82	-29.32	-25.09	-24.07	-25.23	-27.75	-27.38	-25.98	-27.42	-31.87	-34.
6	BUS6	-24.65	-33.04	-26.60	-14.45	-25.64	-33.17	-22.46	-25.64	-28.93	-30.97	-32.31	-27.91	-26.69	-27.92	-30.72	-30.38	-28.78	-30.48	-35.01	-38.
7	BUS7	-28.73	-33.20	-28.72	-14.60	-28.66	-35.36	-28.62	-25.95	-28.06	-31.01	-32.40	-37.99	-26.34	-26.04	-30.78	-30.47	-28.04	-30.48	-36.11	-38.
8	BUS8	-20.33	-36.51	-28.71	-9.69	-19.59	-38.01	-24.00	-18.68	-28.50	-22.33	-33.58	-19.04	-18.97	-20.07	-22.06	-21.53	-20.37	-21.78	-25.08	-28.
9	BUS9	-18.83	-33.90	-18.32	-7.14	-17.06	-28.75	-16.99	-14.69	-18.13	-17.76	-19.01	-14.91	-14.56	-15.61	-17.63	-16.88	-15.64	-17.09	-21.37	-23.
10	BUS10	-13.02	-21.04	-15.63	-6.22	-14.10	-24.40	-12.56	-10.46	-11.43	-12.02	-14.29	-9.89	-9.70	-10.01	-12.63	-11.92	-10.68	-12.33	-16.87	-19.

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> CSC AC Terminal MW* to view the detailed hourly terminal AC real power dispatch of the current source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC AC terminal MW table, a user can choose to display the CSC terminal AC real power dispatch results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed CSC terminal AC real power dispatch results listed in the table.

The screenshot shows a Mozilla Firefox browser window displaying the WINS software interface. The URL in the address bar is <http://236.47.134.23/WINS/CscACP.htm>. The page title is "IEEE118WithWindHVDC_AC". The left sidebar menu includes "Home", "Inputs" (with sub-options like "Area and Owner", "GENCOs Input", "TRANSCOs Input", "DISCOs Input", "System Limits", "Run SCUC"), "Outputs" (with sub-options like "GENCO Output", "TRANSCOs Output" which is expanded to show "Branch Flows", "Phase Shifter", "Tap Changer", "Bus Voltage Magnitude", "Bus Voltage Angle", "HVDC", "CSC AC Terminal MW" (which is selected), "CSC AC Terminal MVAR", and "CSC AC Angle"), and "HVDC". The main content area shows a table titled "All TransCos" with columns H1 through H20. The table contains two rows of data:

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20
C0VT1	5.16	-103.35	32.93	0.03	87.37	127.70	42.43	77.51	29.54	32.23	39.70	19.05	79.87	41.80	96.84	32.31	99.70	83.25	58.11	204.11
C0VT2	-6.16	102.81	-32.87	0.03	-86.93	-126.32	-42.34	-77.23	-29.10	-71.34	-38.64	-15.04	-79.57	-41.71	-98.49	-32.10	-99.16	-88.92	-97.98	-202.41

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> CSC AC Terminal MVAR* to view the detailed hourly terminal AC reactive power dispatch of the current source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC AC terminal MVAR table, a user can choose to display the CSC terminal AC reactive power dispatch results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed CSC terminal AC reactive power dispatch results listed in the table.

The screenshot shows the WINS software interface with the following details:

- Header:** Home > Outputs > TRANSCOs Output > HVDC > CSC AC Dispatch (MVar) - Mozilla Firefox
- Page Title:** IEEE118WithWindHVDC_AC
- Left Sidebar (Outputs):**
 - All TransCos
 - Download Data
 - COVT1
 - COVT2
- Table Headers:** Name, H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, H12, H13, H14, H15, H16, H17, H18, H19, H20, H21, H22, H23, H24, H25, H26, H27, H28, H29
- Table Data:**

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24	H25	H26	H27	H28	H29
COVT1	0.24	6.72	12.87	2.40	0.00	9.29	14.45	21.78	14.32	15.18	0.00	24.45	29.24	17.70	32.78	14.25	30.83	16.11	23.89	23.88	21.18	21.61	8.48	8.19					
COVT2	0.09	0.40	9.50	2.26	0.00	7.29	12.72	11.17	9.87	2.89	0.00	10.62	11.19	18.64	10.98	0.92	7.74	0.00	0.86	13.61	25.45	4.86	1.95	9.19					

Go to *Home* -> *Outputs* -> *TRANSCOs Output* -> *HVDC* -> *CSC AC Angle* to view the detailed hourly AC angles of the current source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC AC angle table, a user can choose to display the CSC AC angle results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed CSC AC angle results listed in the table.

The screenshot shows the WINS web interface with the following details:

- Page Title:** IEEE118WithWindHVDC_AC
- Navigation:** Home > Outputs > TRANSCOs Output > HVDC > CSC AC Angle
- User Options:** My Account, Sign Out
- Left Sidebar:**
 - Home
 - Inputs
 - Area and Owner
 - GENCO Input
 - TRANSCOs Input
 - DISCOs Input
 - System Limits
 - Run SCUC
 - Outputs
 - GENCO Output
 - TRANSCOs Output
 - Branch Flows
 - Phase Shifter
 - Tap Changer
 - Bus Voltage Magnitude
 - Bus Voltage Angle
 - HVDC
 - CSC AC Terminal PW
 - CSC AC Terminal HVAR
 - CSC AC Angle
- Table:** CSC AC Angle

	All TransCos	Download Data																				
Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22
C0VT1	14.66	3.34	3.34	1.07	11.39	9.89	21.08	17.11	19.74	19.77	9.99	14.78	19.56	21.26	10.48	16.88	18.28	15.62	0.09	9.69	20.66	17.60
C0VT2	-12.23	-7.17	-4.64	-13.26	6.88	-9.86	25.98	-12.65	-2.31	-6.29	0.09	0.03	-6.24	12.49	-2.32	0.05	-8.92	-3.48	0.03	-4.41	-14.57	-4.62

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> CSC DC Voltage* to view the detailed hourly voltages of the current source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC DC voltage table, a user can choose to display the CSC DC voltage results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed CSC DC voltage results listed in the table.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19
C0VTL	0.9508	0.9909	0.9508	0.9500	0.9535	1.0177	0.9979	1.0322	0.9644	0.9595	1.0538	1.0016	1.0376	0.9798	1.0933	1.0346	0.9618	0.9978	1.1013
C0VTR	0.9503	0.9887	0.9481	0.9500	0.9467	1.0134	0.9850	1.0335	0.9531	0.9557	1.0619	0.9988	1.0337	0.9687	1.0939	1.0333	0.9566	0.9937	1.0967

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> CSC DC Current* to view the detailed hourly current of the current source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC DC current table, a user can choose to display the CSC DC current results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed CSC DC current results listed in the table.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H1Z	
COVT1	0.0543	-1.0830	0.3464	0.0300	0.9194	-1.2547	0.4295	0.7473	0.2834	0.7527	0.3483	0.1504	0.7697	0.4305	0.0841	0.3137	1.0365	0
COVT2	-0.0542	-1.0830	-0.3464	0.0300	-0.9194	-1.2547	-0.4295	-0.7473	-0.2834	-0.7527	-0.3483	-0.1504	-0.7697	-0.4305	-0.0841	-0.3137	-1.0365	0

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> CSC Firing/Extinction Angle* to view the detailed hourly Firing/Extinction angles of the current source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC Firing/Extinction angle table, a user can choose to display the CSC DC Firing/Extinction angle results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed CSC Firing/Extinction angle results listed in the table.

The screenshot shows the WINS software interface with the following details:

- Header:** Home > Outputs > TRANSCOs Output > HVDC > CSC Firing/Extinction Angle - Main Frame
- Toolbar:** File, Edit, View, History, Bookmarks, Tools, Help
- Address Bar:** http://128.47.134.23/WINS/CsAngle.aspx
- Left Sidebar (Home):**
 - Inputs
 - GENCOs Input
 - TRANSCOs Input
 - DISCOs Input
 - System Limits
 - Run SCUC
 - Outputs
 - GENCOs Output
 - TRANSCOs Output
 - Branch Flows
 - Phase Shifter
 - Tap Changer
 - Bus Voltage Magnitude
 - Bus Voltage Angle
 - HVDC
 - CSC AC Terminal MW
 - CSC AC Terminal MVAR
 - CSC AC Angle
 - CSC DC Voltage
 - CSC DC Current
 - CSC Firing/Extinction Angle
- Central Content:**
 - Page Title: IEEE118WithWindHVDC_AC
 - Breadcrumbs: Home > Outputs > TRANSCOs Output > HVDC > CSC Firing/Extinction Angle
 - User Navigation: Help, Logout, My Account
 - Table Header: All TransCos Download Data
 - Table Data:

Name	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16	I17	I18	I19	I20	I21	I22	I23
COVT1	15.71	9.11	5.31	5.85	12.10	10.45	21.65	37.70	28.61	20.25	13.26	15.75	20.39	21.01	11.34	17.67	18.60	16.22	5.00	9.97	21.28	18.00	20.31
COVT2	13.44	8.17	4.95	14.09	9.70	10.88	16.75	13.44	5.80	7.71	5.20	5.31	7.73	13.68	11.31	5.28	7.83	5.62	5.00	5.03	13.46	5.98	4.87

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> CSC Transformer Tap* to view the detailed hourly transformer turns ratio of the current source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the CSC transformer tap table, a user can choose to display the CSC transformer tap results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed CSC transformer tap results listed in the table.

The screenshot shows the WINS web application interface. The URL in the browser is <http://123.47.139.239/WINS/WC101app.aspx>. The main menu on the left includes Home, Inputs, GENCOs Input, TRANSCOs Input, DISCOs Input, System Limits, Run SCUC, and Outputs. Under Outputs, TRANSCOs Output is selected, showing options for Branch Flows, Phase Shifter, Tap Changer, Bus Voltage Magnitude, Bus Voltage Angle, and HVDC. The HVDC section is expanded, showing CSC AC Terminal MW, CSC AC Terminal MVAR, CSC AC Angle, CSC DC Voltage, CSC DC Current, CSC Firing/Extinction Angle, CSC Transformer Tap, and VNC AC Terminal MW. The central content area is titled "IEEE118WithWindHVDC_AC" and shows a table of CSC Transformer Tap data. The table has columns for Name (COVT1, COVT2), H1 through H19, and CSC Transformer Tap values ranging from 0.9609 to 1.0270. A "Download Data" button is located above the table.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19
COVT1	0.9609	1.0038	0.9964	0.9472	0.9923	0.9928	0.9779	1.0044	0.9934	0.9948	0.9944	0.9942	1.0155	0.9639	1.0268	0.9972	0.9910	0.9974	1.0158
COVT2	0.9685	1.0253	0.9865	0.9984	0.9885	1.0636	1.0680	1.0948	0.9829	0.9952	1.0628	1.0562	1.0742	1.0270	1.1251	1.0630	0.9937	1.0546	1.1288

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> VSC AC Terminal MW* to view the detailed hourly terminal AC real power dispatch of the voltage source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC terminal AC dispatch (MW) table, a user can choose to display the VSC terminal AC real power dispatch results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed VSC terminal AC real power dispatch results listed in the table.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	
VSC1	-17.77	-55.90	-65.31	-34.69	-21.74	-19.33	-42.15	-51.2	-31.73	-42.74	-25.67	-6.00	5.04	5.72	-23.33	-9.52	3.78	-26.57	-11
VSC2	-17.61	-64.81	-63.60	-34.61	-21.60	-18.01	-43.48	-51.1	-31.68	-43.45	-25.92	-6.01	5.04	5.73	-23.94	9.56	-3.78	26.45	11
VSC3	-41.48	-10.68	-59.32	-158.65	-81.00	-38.03	-17.01	9.96	-6.58	-36.90	-79.22	-107.02	-70.74	-88.30	-86.57	-89.76	-21.24	-28.37	-13
VSC4	-42.14	10.71	-49.36	-149.14	-90.31	-37.79	-17.19	-3.85	6.80	-37.43	81.75	121.74	74.05	38.66	47.41	10.73	21.41	28.47	14
VSC5	-34.45	-19.49	19.81	-40.18	-14.94	3.79	-2.66	-0.80	-5.78	-42.10	8.34	-34.55	-26.98	-1.12	-58.99	-4.76	-40.00	-97.73	-6
VSC6	1.45	23.70	-19.76	-39.48	-72.29	-1.79	2.84	0.98	5.76	42.79	-6.34	39.30	28.77	1.12	60.36	4.39	41.62	101.69	67
VSC7	13.58	-9.52	13.53	90.48	-12.42	-2.59	15.27	0.33	-7.69	-49.12	-94.40	-23.67	-6.33	1.07	-37.58	-82.66	-42.08	-18.74	-97
VSC8	-13.43	8.54	-12.46	-87.38	-32.03	2.32	15.29	-0.33	7.71	71.04	96.03	23.89	5.34	-1.07	38.08	89.42	42.69	18.87	98
VSC9	-70.95	-100.00	-96.47	-171.98	-2.77	-34.28	-96.08	-20.71	-46.85	-200.00	-108.00	-100.00	-108.00	-97.24	-59.44	-100.00	-100.00	-100.00	-100.00
VSC10	46.36	58.13	24.96	13.98	12.08	10.97	50.95	58.73	34.08	61.39	53.05	58.72	49.82	51.54	44.28	58.74	27.57	39.51	20

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> VSC AC Terminal MVAR* to view the detailed hourly terminal AC reactive power dispatch of the voltage source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC terminal AC dispatch (MVar) table, a user can choose to display the VSC terminal AC reactive power dispatch results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed VSC terminal AC reactive power dispatch results listed in the table.

The screenshot shows the WINS software interface with the following details:

- Header:** Home > Outputs > TRANSCOs Output > HVDC > VSC AC Terminal MVAR - Mozilla Firefox
- Toolbar:** File Edit View History Bookmarks Tools Help
- Address Bar:** http://128.47.134.239/WINS/VSCACQ.aspx
- Left Sidebar:**
 - Home
 - Inputs
 - Area and Owner
 - GENCOs Input
 - TRANSCOs Input
 - DISCOs Input
 - System Limits
 - Run SCUC
 - Outputs
 - TRANSCOs Output
 - Branch Flows
 - Phase Shifter
 - Tap Changer
 - Bus Voltage Magnitude
 - Bus Voltage Angle
 - HVDC
 - CSC AC Terminal MW
 - CSC AC Terminal MVAR
 - CSC AC Angle
 - CSC DC Voltage
 - CSC DC Current
 - CSC Firing/Extinction Angle
 - CSC Transformer Tap
 - VSC AC Terminal MW
 - VSC AC Terminal MVAR
 - VSC AC Angle
- Central Content:**
 - IEEE118WithWindHVDC_AC
 - Home > Outputs > TRANSCOs Output > HVDC > VSC AC Terminal MVAR
 - Download Data
 - All TRANSCOs
- Data Table:**

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19
VSC1	-67.41	-66.80	-76.99	65.99	34.93	2.67	35.20	29.16	-14.39	-60.82	-67.62	-63.84	13.85	7.58	-24.21	-62.29	-12.99	-93.49	-70.60
VSC2	55.31	15.00	17.54	18.53	-0.96	13.99	2.70	-13.02	33.77	53.28	64.85	66.69	-0.04	-1.48	61.84	62.18	-4.44	63.93	70.60
VSC3	62.69	23.35	38.09	-1.29	29.48	29.92	68.46	60.05	66.76	57.47	70.00	67.54	68.55	69.87	65.37	69.50	65.96	59.49	60.72
VSC4	66.18	63.61	70.00	63.52	73.00	70.00	70.00	70.00	69.88	70.00	58.47	70.00	67.98	48.82	67.49	70.00	63.87	66.16	70.60
VSC5	-69.84	70.00	33.82	70.00	70.00	-67.04	98.64	98.68	48.78	69.78	42.82	70.00	44.73	61.90	33.79	-49.50	60.60	65.75	70.60
VSC6	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	58.28	70.00	67.45	70.00	70.00	69.86	70.00	58.84	70.60
VSC7	-41.17	14.89	59.92	54.98	62.88	61.29	35.26	49.52	63.07	68.37	70.00	68.69	48.43	62.41	69.38	69.48	-54.17	19.41	70.60
VSC8	-70.00	70.00	6.85	14.27	7.99	-46.52	33.20	-3.11	63.28	-60.91	6.43	8.00	-1.81	-12.89	49.88	-70.00	-67.82	-67.78	30.82
VSC9	189.65	180.04	87.69	125.37	137.68	143.69	157.24	206.68	185.49	232.81	294.98	227.01	147.35	186.73	221.76	182.34	192.82	189.03	211.73
VSC10	-50.51	50.65	-50.34	-50.29	-50.29	50.29	-50.58	-50.66	-50.40	-50.81	-50.60	-50.66	-50.95	-50.87	-50.49	-50.88	-50.36	-50.45	-50.38

Go to *Home* -> *Outputs* -> *TRANSCOs Output* -> *HVDC* -> *VSC AC Angle* to view the detailed hourly AC angle of the voltage source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC AC angle table, a user can choose to display the VSC AC angle results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed VSC AC angle results listed in the table.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24
VSC1	0.20	-0.57	0.46	0.38	-0.04	0.19	0.47	-0.05	-0.12	-0.47	-0.29	0.06	-0.05	-0.18	-0.25	0.10	-0.10	0.29	0.13	-0.52	0.42	-0.37	0.58	0
VSC2	-0.17	-0.43	-0.75	-0.17	-0.24	-0.23	-0.69	-0.05	-0.12	-0.47	-0.29	0.06	-0.05	-0.18	-0.25	0.10	-0.10	0.29	0.13	-0.52	0.42	-0.37	0.58	0
VSC3	-0.49	-0.11	0.60	1.89	0.40	0.44	0.20	0.04	-0.07	-0.38	-0.02	-1.16	-0.00	-0.43	-0.40	-0.94	-0.77	-0.29	-1.43	-1.05	-1.47	-0.51	-0.20	0
VSC4	0.41	0.10	-0.51	-1.67	-0.57	-0.39	-0.18	-0.04	0.07	0.40	0.87	1.22	0.80	0.42	0.51	0.55	0.33	0.30	1.45	1.78	1.42	0.54	0.20	0
VSC5	-0.03	-0.29	0.22	0.49	0.04	-0.03	0.00	-0.06	-0.42	0.06	-0.36	-0.27	-0.01	-0.59	-0.03	-0.40	-0.97	-0.69	1.49	-0.34	-0.02	0.00	-0	0
VSC6	0.03	0.23	-0.29	-0.44	-0.82	-0.04	0.03	0.00	0.06	0.46	-0.18	0.38	0.28	0.01	0.65	0.05	-0.44	1.39	0.71	1.48	0.21	0.02	0.00	0
VSC7	0.14	-0.10	0.15	1.06	0.38	-0.02	0.12	0.00	-0.08	-0.22	-1.00	-0.28	-0.06	0.02	-0.39	-0.93	-0.48	-0.19	-0.93	-0.60	-2.20	-0.62	-1.34	-0
VSC8	-0.13	0.10	-0.15	-1.03	-0.37	0.02	-0.17	0.00	0.09	0.81	1.19	0.28	0.04	-0.31	0.43	0.90	-0.47	0.21	0.42	0.70	2.39	0.69	1.38	0
VSC9	-0.77	-1.08	-1.15	-0.87	-0.82	-0.40	-1.04	-0.22	-0.54	-1.04	-1.03	1.06	-1.30	-0.58	-1.10	-1.09	-1.04	-0.64	5.01	-0.71	-0.05	-0.94	-1	0
VSC10	0.24	0.37	0.15	0.03	0.06	0.07	0.32	0.37	0.21	0.44	0.34	0.37	0.31	0.38	0.28	0.37	0.17	0.25	0.19	0.26	0.22	0.29	0.37	0
VSC11	0.17	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0
VSC12	0.17	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0
VSC13	0.17	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0
VSC14	0.17	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0
VSC15	0.17	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> VSC DC Voltage* to view the detailed hourly DC voltage of the voltage source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC DC voltage table, a user can choose to display the VSC DC voltage results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed VSC DC voltage results listed in the table.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	
VSC1	1.1503	1.1500	1.1500	1.1493	1.1503	1.1499	1.1500	1.1503	1.1500	1.1500	1.1501	1.1507	1.1473	1.1500	1.1500	1.1397	1.1443	1.1491	1.1397	1.1449
VSC2	1.1422	1.1254	1.1216	1.1428	1.1405	1.1420	1.1384	1.1477	1.1448	1.1500	1.1500	1.1500	1.1479	1.1479	1.1500	1.1482	1.1475	1.1452	1.1500	
VSC3	1.1316	1.1451	1.1500	1.1500	1.1497	1.1500	1.1500	1.1471	1.1397	1.1544	1.1019	1.1374	1.1391	1.1299	1.1279	1.1404	1.1376	1.0876		
VSC4	1.1500	1.1500	1.1391	1.1828	1.1278	1.1338	1.1424	1.1482	1.1500	1.1500	1.1500	1.1499	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1490	
VSC5	1.1484	1.1394	1.1500	1.1497	1.1500	1.1487	1.1491	1.1474	1.1313	1.1609	1.1587	1.1393	1.1495	1.1237	1.1429	1.1323	1.1067	1.1205		
VSC6	1.1500	1.1500	1.1413	1.1323	1.1376	1.1483	1.1500	1.1498	1.1500	1.1500	1.1472	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	
VSC7	1.1484	1.1459	1.1500	1.1500	1.1500	1.1469	1.1500	1.1498	1.1466	1.1164	1.1079	1.1398	1.1476	1.1500	1.1311	1.1128	1.1334	1.1417	1.1384	
VSC8	1.1428	1.1500	1.1441	1.1108	1.1269	1.1500	1.1433	1.1497	1.1500	1.1471	1.1500	1.1803	1.1500	1.1498	1.1477	1.1500	1.1300	1.1500	1.1300	
VSC9	1.1324	1.1822	1.1869	1.1898	1.1979	1.1807	1.1847	1.1987	1.1837	1.1869	1.1869	1.1824	1.1732	1.1493	1.1347	1.1928	1.1871	1.1900	1.1873	
VSC10	1.1361	1.1973	1.1908	1.1898	1.1980	1.1924	1.1898	1.1997	1.1961	1.1919	1.1939	1.1974	1.1783	1.1504	1.1577	1.1975	1.1922	1.1950	1.1905	

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> VSC DC Current* to view the detailed hourly DC current of the voltage source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC DC current table, a user can choose to display the VSC DC current results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed VSC DC current results listed in the table.

The screenshot shows a web browser window for Mozilla Firefox displaying the WINS (Wind Integration Network Simulator) application. The URL is <http://128.47.134.239/WINS/WsDocument.aspx>. The page title is "IEEE118WithWindHVDC_AC". The navigation menu on the left includes "Home", "Inputs" (with sub-options like Area and Owner, GENEDCs Input, TRANSCOs Input, DISCOS Input, System Limits, Bus SCUC, Outputs, GENEDCs Output, TRANSCOs Output, Branch Flows, Phase Shifter, Tap Changer, Bus Voltage Magnitude, Bus Voltage Angle, HVDC, CSC AC Terminal MW, CSC AC Terminal MVAR, CSC AC Angle, CSC DC Voltage, CSC DC Current, CSC Firing/Extinction Angle, CSC Transformer Tap, VSC AC Terminal MW, VSC AC Terminal MVAR, VSC AC Angle, VSC DC Voltage, VSC DC Current, and VSC Modulation Index), and "Outputs" (with sub-options like TRANSCOs Output, HVDC, VSC DC Current, and VSC Modulation Index). The main content area shows a table titled "All TRANSCOs" with a "Download Data" button. The table has columns for Name, M1, M2, M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13, M14, M15, M16, M17, M18, and M19. The data rows represent different VSC components (VSC1 through VSC10) and their corresponding hourly DC current values.

Name	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19
VSC1	0.1545	0.4563	0.5670	0.1270	0.1998	0.1576	0.3866	0.0445	0.1010	-0.0778	-0.2254	-0.0723	0.0438	0.0487	0.2047	-0.0032	0.0322	-0.0322	
VSC2	-0.1345	-0.4868	-0.5670	-0.1270	-0.1998	-0.1576	-0.3866	-0.0445	-0.1010	0.3778	0.2254	0.0523	-0.0438	-0.0487	0.2047	0.0032	-0.0322	0.0322	
VSC3	-0.3684	-0.0331	0.4376	1.3798	0.4461	0.3329	0.1504	0.0344	-0.0574	-0.3255	-0.7108	-0.9717	-0.4509	-0.3382	-0.4122	-0.4411	-0.1862	-0.1862	
VSC4	0.3614	0.0331	-0.4376	-1.3798	-0.4461	-0.3329	-0.1504	-0.0344	0.0574	0.3255	0.7108	0.9717	0.4509	0.3382	0.4122	0.4411	0.1862	0.1862	
VSC5	-0.0380	-0.2061	0.3731	0.3486	0.6464	0.0320	-0.0248	-0.0079	-0.0160	-0.0721	0.0551	-0.3843	-0.2527	-0.0097	-0.5249	-0.0413	-0.2933	-0.2933	
VSC6	0.0380	0.2061	-0.3731	-0.3486	-0.6464	-0.0320	0.0248	0.0079	0.0160	0.0721	-0.0551	0.3843	0.2527	0.0097	0.5249	0.0413	0.2933	0.2933	
VSC7	0.1175	-0.0830	0.1177	0.7967	0.2819	-0.0292	0.1337	0.0028	-0.0670	-0.6191	-0.8524	-0.2977	-0.3464	0.0050	-0.3320	-0.7428	-0.3712	-0.3712	
VSC8	-0.1175	0.0830	-0.1177	-0.7967	-0.2819	0.0292	-0.1337	-0.0028	0.0670	0.6191	0.8524	0.2977	0.3464	-0.0050	0.3320	0.7428	0.3712	0.3712	
VSC9	-0.6229	-0.8707	-0.8134	-0.6068	-0.8231	-0.2079	-0.8110	-0.1738	-0.6082	-0.8428	-0.8639	-0.8166	-0.8222	-0.8489	-0.4885	-0.6388	-0.8423	-0.8423	
VSC10	0.6251	0.4855	0.2056	0.1169	0.6098	0.8920	0.4103	0.4895	0.2649	0.7811	0.4510	0.8903	0.4237	0.5175	0.3882	0.4905	0.2312	0.2312	

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> VSC Modulation Index* to view the detailed hourly modulation index of the voltage source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC modulation index table, a user can choose to display the VSC modulation index results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed VSC modulation index results listed in the table.

The screenshot shows the WINS software interface with the following details:

- URL:** http://128.47.134.239/WINS/VscModulation.aspx
- Table Headers:** All TransCos, Download Data
- Table Rows:** 1-24 (24 hours)

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	
VSC1	0.8622	0.9231	0.9091	0.8708	0.8772	0.8925	0.861	0.8832	0.9001	0.9418	0.9395	0.9239	0.8643	0.8863	0.9544	0.9301	0.8967	0.9245	0.9345	0.7
VSC2	0.8434	0.8801	0.8772	0.8648	0.8894	0.8593	0.8908	0.9030	0.9091	0.8999	0.8695	0.8734	0.8802	0.8838	0.8824	0.8825	0.8875	0.8791	0.8818	0.3
VSC3	0.8649	0.8892	0.8471	0.8524	0.8539	0.8681	0.8544	0.8509	0.8609	0.9121	0.9398	0.9251	0.9033	0.8793	0.9248	0.8870	0.9057	0.9168	0.9454	0.7
VSC4	0.9571	0.9117	0.9221	0.8274	0.8833	0.8128	0.8943	0.8987	0.8948	0.8871	0.8995	0.8848	0.8892	0.8856	0.8873	0.8880	0.8863	0.8819	0.9304	0.7
VSC5	0.8413	0.9024	0.8627	0.8708	0.8628	0.8799	0.8873	0.8863	0.8688	0.9408	0.9294	0.9150	0.9118	0.8869	0.8570	0.8941	0.9348	0.9451	0.9228	0.7
VSC6	0.9365	0.9209	0.9124	0.8849	0.8913	0.9017	0.8891	0.8977	0.8948	0.8871	0.8978	0.8847	0.8933	0.8816	0.8868	0.8909	0.8563	0.8934	0.8998	0.7
VSC7	0.9138	0.8908	0.8567	0.8515	0.8455	0.8507	0.8609	0.8504	0.8779	0.9319	0.9217	0.9037	0.8738	0.8648	0.9127	0.8959	0.9026	0.9217	0.8884	0.7
VSC8	0.9292	0.9144	0.8517	0.8872	0.8687	0.8958	0.8667	0.8748	0.8459	0.8798	0.8588	0.8568	0.8547	0.8583	0.8740	0.8814	0.8848	0.8793	0.8471	0.7
VSC9	0.8882	0.8854	0.8152	0.8097	0.7964	0.8173	0.8532	0.8403	0.8339	0.8628	0.8559	0.8515	0.8566	0.8624	0.8394	0.8393	0.8468	0.8628	0.8547	0.7
VSC10	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC11	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC12	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC13	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC14	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC15	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC16	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC17	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC18	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC19	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC20	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC21	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC22	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC23	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7
VSC24	0.8541	0.7934	0.7977	0.8034	0.7929	0.7968	0.8003	0.7929	0.7968	0.7959	0.7933	0.8061	0.8251	0.8349	0.7932	0.7968	0.7953	0.7982	0.7982	0.7

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> VSC Internal AC Voltage* to view the detailed hourly internal AC voltage of the voltage source converters of the system. Besides, by selecting the different items in the dropdown list on the top left of the VSC internal AC voltage table, a user can choose to display the VSC internal AC voltage results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed VSC internal AC voltage results listed in the table.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24
VSC1	0.9918	1.0621	1.0443	1.0009	1.0089	1.8265	0.9995	1.0157	1.0363	1.0651	1.067	1.0609	1.0377	1.0217	1.0422	1.0443	1.0329	1.0482	1.0700					
VSC2	1.0776	0.9907	0.9693	0.9884	1.0144	0.9813	1.0081	1.0364	1.0408	1.0234	1.0000	1.0044	1.0104	1.0149	1.0136	1.0125	1.0164	1.0168	0.9908					
VSC3	0.9823	1.0139	0.9761	0.9803	0.9689	0.9866	0.9626	0.9785	1.0105	1.0443	1.0404	1.0189	1.0094	0.9526	1.0445	1.0095	1.0339	1.0439	1.0389					
VSC4	1.0776	1.0599	1.0414	1.0026	0.9961	1.0354	1.0225	1.0518	1.0291	1.0202	1.0299	1.0172	1.0225	1.0184	1.0204	1.0212	1.0159	1.0257	1.0345					
VSC5	1.0259	1.0281	1.0252	1.0012	0.9989	1.0119	1.0193	1.0184	1.0427	1.0639	1.0689	1.0394	1.0377	1.0199	1.0754	1.0263	1.0589	1.0672	1.0394					
VSC6	1.0778	1.0587	1.0414	1.0013	0.9963	1.0355	1.0228	1.0319	1.0291	1.0202	1.0108	1.0175	1.0227	1.0138	1.0199	1.0212	1.0192	1.0174	1.0348					
VSC7	1.0495	1.0207	0.9892	0.9792	0.9729	0.9775	1.0331	1.0282	1.0061	1.0403	1.0318	1.0299	1.0029	0.9949	1.0324	0.9971	1.0212	1.0254	1.0076					
VSC8	1.0117	1.0518	1.0698	0.9894	0.9868	1.0202	0.9809	1.0093	0.9724	1.0348	0.9642	0.9644	0.9823	0.9872	1.0031	1.0138	1.0371	1.0112	0.9741					
VSC9	1.0024	1.0198	0.9669	0.9595	0.9540	0.9733	1.0109	1.0018	0.9969	1.0238	1.0297	1.0293	1.0051	0.9877	1.0207	1.0069	1.0063	1.0289	1.0248					
VSC10	0.9704	0.9503	0.9508	0.9503	0.9502	0.9528	0.9508	0.9548	0.9503	0.9504	0.9503	0.9503	0.9502	0.9503	0.9503	0.9501	0.9501	0.9501	0.9501					
VSC11	0.9704	0.9503	0.9508	0.9503	0.9502	0.9528	0.9508	0.9548	0.9503	0.9504	0.9503	0.9503	0.9502	0.9503	0.9503	0.9501	0.9501	0.9501	0.9501					
VSC12	0.9704	0.9503	0.9508	0.9503	0.9502	0.9528	0.9508	0.9548	0.9503	0.9504	0.9503	0.9503	0.9502	0.9503	0.9503	0.9501	0.9501	0.9501	0.9501					

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> DC Branch Current* to view the detailed hourly current of the DC lines of the system. Besides, by selecting the different items in the dropdown list on the top left of the DC branch current table, a user can choose to display the DC branch current results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed DC branch current results listed in the table.

The screenshot shows the WINS User Manual interface for the IEEE118WithWindHVDC_AC system. The main content area displays a table titled "DC Branch Current" with 12 columns representing hours from H1 to H12. The table contains numerical values for each branch, such as DCBRANCH1 through DCBRANCH12. The table is styled with alternating row colors for readability. Above the table, there is a dropdown menu labeled "All TransCos" and a "Download Data" button. The left sidebar contains a navigation tree with categories like Home, Inputs, Outputs, and HVDC, with various sub-options under each.

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	
DCBRANCH1	0.1545	0.4068	0.5670	0.1270	0.1990	0.1576	0.3666	0.0645	0.1020	-0.3779	-0.2294	-0.0523	0.0438	0.0497	-0.2047	-0.0832	
DCBRANCH2	-0.3664	-0.0735	0.4376	1.3798	0.4481	0.3134	0.1504	0.0344	-0.0578	-0.1255	-0.7146	-0.9737	-0.6508	-0.3362	-0.4122	-0.4411	0.1
DCBRANCH3	-0.0300	-0.2061	0.1731	0.3488	0.6484	0.0330	-0.0248	-0.0079	-0.0500	-0.3721	0.0551	-0.3843	-0.2327	-0.0097	-0.5269	-0.0813	0.
DCBRANCH4	0.1175	-0.0830	0.1177	0.7867	0.2815	-0.0201	0.1337	0.0028	-0.0670	-0.4195	-0.8544	-0.2077	-0.5464	0.0989	-0.3320	-0.7428	0.
DCBRANCH5	-0.6129	-0.3387	-0.6134	-0.6066	-0.0231	-0.2979	-0.0110	-0.1720	-0.4092	-0.8425	-0.8409	0.0386	-0.4522	-0.8489	-0.6995	0.1	
DCBRANCH6	0.1978	-0.3531	-0.6037	-0.4896	0.2898	-0.1959	-0.3827	-0.2167	-0.1242	-0.2603	-0.3959	-0.3462	-0.4294	-0.3113	-0.6992	-0.3480	0.
DCBRANCH7	0.0906	0.8554	0.8398	0.8240	0.8393	0.8390	0.7418	0.8216	0.8364	0.8393	0.8377	0.8354	0.8408	0.8590	0.8798	0.8813	0.
DCBRANCH8	0.4714	-0.3047	-1.0660	-2.0143	-0.3657	-0.5986	-0.5747	0.0154	-0.4756	-0.6999	-0.6941	-0.0633	-0.0009	-0.8911	-0.5081	-0.8788	0.
DCBRANCH9	0.0710	-0.7169	0.0187	-0.0702	-0.8750	0.3048	0.8401	0.3131	0.3311	0.3363	0.3780	0.2999	-0.6184	0.6959	-0.1677	-0.2395	0.
DCBRANCH10	-0.6532	0.3802	-0.7025	0.9189	0.5004	-0.6353	-0.9345	0.3219	-0.3538	0.7978	-0.5215	-0.0403	0.3937	-1.0754	0.3339	-0.1647	0.
DCBRANCH11	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.
DCBRANCH12	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.1240	0.

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> DC Branch Flow FT(TF)* to view the detailed hourly branch flow of the DC lines of the system. Besides, by selecting the different items in the dropdown list on the top left of the DC branch flow table, a user can choose to display the DC branch flow results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed DC branch flow results listed in the table.

Name	B1	B2	B3	B4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
DCBRANCH1	-17.77	55.98	65.21	34.69	21.74	18.13	42.35	53.12	31.79	-42.74	-25.66	-6.00	5.04	5.72	-23.33	-9.52	-3.70
DCBRANCH2	-41.47	-18.67	59.32	159.65	51.30	38.33	17.30	3.94	-6.58	-26.80	-79.22	-187.02	-72.73	-38.10	-46.55	-49.75	-21.24
DCBRANCH3	-0.45	-0.49	15.91	40.18	74.34	3.79	-2.85	-0.90	-5.74	-42.10	6.04	-34.83	-26.49	-1.11	-50.98	-4.76	-40.00
DCBRANCH4	13.60	-9.51	13.53	90.48	32.42	-2.92	15.37	0.33	-7.69	-69.12	-54.46	-31.67	-6.33	1.07	-17.55	-62.66	-42.00
DCBRANCH5	-16.54	-99.99	-96.47	-71.66	-2.77	-34.26	-96.08	-28.71	-48.95	-99.99	-99.99	-99.99	-97.24	-55.43	-100.00	-99.99	-9
DCBRANCH6	-22.47	-42.28	-71.98	-58.19	18.29	-23.36	-45.52	38.00	-24.86	-31.02	-46.56	-41.70	-58.61	-38.12	-11.23	-41.47	-72.85
DCBRANCH7	100.07	100.06	109.07	97.99	100.06	100.07	88.27	98.53	106.06	105.07	105.06	100.06	100.08	200.07	100.07	100.09	100.07
DCBRANCH8	53.57	-98.39	-127.01	-120.61	-87.77	-65.90	-60.39	1.88	-52.11	-62.25	83.18	-103.48	-91.38	-103.55	-17.47	-105.27	-105.58
DCBRANCH9	100.07	-86.21	1.29	-8.36	-104.82	36.39	100.07	13.56	39.84	100.07	45.42	-94.70	-98.61	-69.83	-7.71	-22.66	8.89
DCBRANCH10	-75.43	45.69	-83.81	-139.45	60.80	-81.57	-117.27	39.45	-42.35	-35.21	63.18	-7.20	47.28	-123.95	13.73	-9.38	-78.58
DCBRANCH11	1.2																

Home > Outputs > TRANSCOs Output > HVDC > DC Branch Flow TF - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://235.47.134.239/WINS/outputs/HVDCBranchFlowTF.aspx

Home > Outputs > TRANSCOs Output ...

WINS

IEEE118WithWindHVDC_AC

All TransCos Download Data

Name	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
DCBRANCH1	-17.65	-54.00	-63.00	-34.61	-21.56	-18.03	-41.49	-5.11	-11.08	-43.05	25.92	6.01	-5.03	-5.71	23.54	9.56	-3.70	26.43
DCBRANCH2	42.14	20.71	-49.38	-149.13	50.31	-37.77	-17.19	-5.05	5.00	-37.43	31.75	111.74	74.05	16.66	47.41	50.73	21.41	26.47
DCBRANCH3	3.45	23.76	-19.76	-39.50	-72.25	-3.79	2.85	0.90	5.76	-42.79	-6.33	35.00	26.77	1.12	40.38	4.75	-40.62	101.62
DCBRANCH4	-13.43	9.54	-13.48	-67.30	-32.02	2.32	-15.26	-0.33	7.71	71.04	36.03	23.03	5.04	-1.07	36.10	65.42	42.89	10.07
DCBRANCH5	78.78	103.42	96.86	72.19	2.77	34.33	66.48	20.73	48.95	100.42	100.42	100.42	100.42	97.67	35.57	100.42	103.42	108.42
DCBRANCH6	22.48	42.29	71.94	18.22	-10.28	23.36	45.54	-57.39	14.86	31.03	46.57	41.71	30.62	18.13	11.29	41.89	72.89	60.93
DCBRANCH7	-309.00	-99.99	-99.99	-97.92	-99.99	-99.99	-88.22	-96.46	-99.99	-98.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99	-99.99
DCBRANCH8	53.61	96.31	127.14	120.02	67.84	70.03	68.46	-1.01	53.15	82.26	83.24	103.55	95.48	102.73	37.52	103.42	105.74	97.70
DCBRANCH9	-99.99	86.27	-1.20	8.36	105.00	-36.34	-100.00	-13.56	-39.43	-89.98	-45.80	34.79	96.68	-89.00	7.71	22.06	-8.59	-8.79
DCBRANCH10	75.78	-45.49	84.22	110.13	-39.80	81.95	110.05	-29.36	42.43	95.73	63.40	7.00	-47.03	124.00	-11.72	5.37	70.92	41.70

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> DC Branch Loss* to view the detailed hourly power loss of the DC lines of the system. Besides, by selecting the different items in the dropdown list on the top left of the DC branch loss table, a user can choose to display the DC branch power loss results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed DC branch power loss results listed in the table.

The screenshot shows a web-based application for WINS. The URL is <http://128.47.134.239/WINS/HVDC/DCBranchLoss.aspx>. The page title is "IEEE118WithWindHVDC_AC". The left sidebar has a tree menu with categories like Home, Inputs, Outputs, Run SCUC, and HVDC. The "Outputs" section is expanded, showing sub-options like TRANSCOs Output, HVDC, and DC Branch Loss. The main content area displays a table titled "All TransCos" with a "Download Data" button. The table has columns for Name and 24 hours (H1-H24). The first few rows of the table are:

Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24	Sum		
DCBRANCH1	0.11	3.18	3.69	0.59	0.37	0.32	0.67	0.40	0.05	0.73	0.25	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.26	0.05	0.00	1.10	0.41	1.85	0.13	10%
DCBRANCH2	0.67	0.04	0.95	-9.51	-0.99	0.55	0.11	0.40	0.01	0.52	-2.57	-4.72	-2.11	0.56	-0.84	-0.97	-0.17	-0.70	-7.53	-11.34	7.32	0.94	0.14	0.88	10%		
DCBRANCH3	0.60	0.21	0.34	0.40	2.00	0.08	0.09	0.00	0.01	0.69	0.03	0.46	0.27	0.09	1.37	0.00	0.62	0.90	1.73	7.36	0.36	0.00	0.00	0.42	10%		
DCBRANCH4	0.06	0.03	0.06	-3.89	-0.39	0.08	0.00	0.60	0.02	1.91	3.63	0.21	0.01	0.00	0.65	1.75	0.68	0.18	0.50	1.59	15.12	1.39	8.04	2.60	10%		
DCBRANCH5	0.23	0.42	0.39	0.22	0.00	0.04	0.29	0.01	0.20	0.42	0.42	0.42	0.43	0.49	0.54	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	10%	
DCBRANCH6	3.90	0.01	0.03	0.02	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.03	0.03	0.02	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	10%	
DCBRANCH7	0.07	0.06	0.07	0.06	0.06	0.07	0.05	0.06	0.06	0.07	0.07	0.06	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.07	0.07	10%	
DCBRANCH8	0.04	0.12	0.21	0.20	0.08	0.08	0.00	0.03	0.09	0.14	0.13	0.15	0.05	0.18	0.15	0.13	0.06	0.09	0.07	0.12	0.12	0.21	0.01	0.01	0.01	10%	
DCBRANCH9	0.07	0.09	0.09	0.00	0.07	0.09	0.07	0.00	0.01	0.07	0.01	0.00	0.06	0.03	0.00	0.00	0.00	0.00	0.07	0.07	0.00	0.00	0.00	0.00	0.00	10%	
DCBRANCH10	0.15	0.11	0.38	0.87	0.20	0.37	0.77	0.18	0.10	0.58	0.22	0.00	0.12	0.92	0.00	0.00	0.34	0.09	0.75	0.52	0.00	0.13	0.11	0.26	10%		

Go to *Home -> Outputs -> TRANSCOs Output -> HVDC -> DC Bus Voltage* to view the detailed bus voltage magnitude of the DC lines of the system. Besides, by selecting the different items in the dropdown list on the top left of the DC bus voltage magnitude table, a user can choose to display the DC bus voltage magnitude results of individual TARNSCOs or all TRANSCOs. The "Download Data" button allows a user to download the detailed DC bus voltage magnitude results listed in the table.

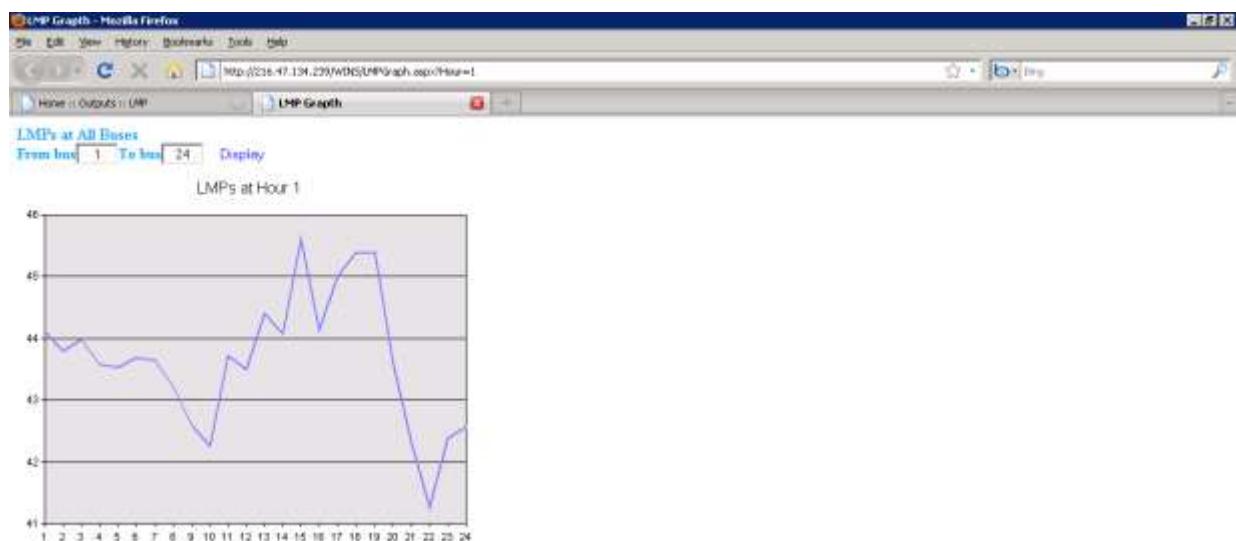
Name	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19
DCBUS1	1.1500	1.1500	1.1500	1.1493	1.1500	1.1499	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	
DCBUS2	1.1422	1.1256	1.1211	1.1429	1.1405	1.1429	1.1316	1.1477	1.1549	1.1500	1.1500	1.1500	1.1478	1.1475	1.1503	1.1483	1.1475	1.1452	1.150
DCBUS3	1.1316	1.1453	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1471	1.1337	1.1344	1.1213	1.1174	1.1331	1.1293	1.1279	1.1408	1.1376	1.081
DCBUS4	1.1500	1.1500	1.1201	1.1018	1.1276	1.1330	1.1424	1.1445	1.1500	1.1500	1.1500	1.1495	1.1500	1.1503	1.1500	1.1500	1.1500	1.1500	1.144
DCBUS5	1.1494	1.1298	1.1500	1.1493	1.1500	1.1500	1.1497	1.1491	1.1474	1.1313	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
DCBUS6	1.1500	1.1350	1.1413	1.1323	1.1170	1.1483	1.1500	1.1495	1.1500	1.1500	1.1472	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
DCBUS7	1.1484	1.1458	1.1500	1.1500	1.1500	1.1489	1.1500	1.1499	1.1466	1.1364	1.1073	1.1390	1.1476	1.1500	1.1311	1.1124	1.1314	1.1417	1.150
DCBUS8	1.1426	1.1500	1.1441	1.1106	1.1359	1.1500	1.1412	1.1497	1.1500	1.1473	1.1500	1.1500	1.1495	1.1477	1.1501	1.1500	1.1500	1.1500	1.1500
DCBUS9	1.1324	1.1322	1.1058	1.1050	1.1397	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507	1.1507
DCBUS10	1.1361	1.1923	1.1050	1.1050	1.1924	1.1094	1.1997	1.1561	1.1019	1.1938	1.1974	1.1703	1.1504	1.1977	1.1977	1.1977	1.1977	1.1977	1.1977
DCBUS11	1.1973	1.1908	1.1886	1.1900	1.1924	1.1094	1.1997	1.1561	1.1019	1.1938	1.1974	1.1703	1.1504	1.1977	1.1977	1.1977	1.1977	1.1977	1.1977
DCBUS12	1.1908	1.1923	1.1050	1.1050	1.1924	1.1094	1.1997	1.1561	1.1019	1.1938	1.1974	1.1703	1.1504	1.1977	1.1977	1.1977	1.1977	1.1977	1.1977

3.6.3 Outputs – LMP

Go to *Home* -> *Outputs* -> *LMP* to view the detailed hourly locational marginal prices (LMPs) of the system in both tabular and graphical forms.

Bus No	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24																				
1	42.32	42.97	39.58	32.68	58.50	38.44	43.23	43.32	46.94	44.16	44.16	43.59	42.89	42.54	44.16	45.03	46.76	45.02	46	42.32	42.63	35.55	32.68	52.12	38.44																			
2	42.32	42.63	35.55	32.68	52.12	38.44	47.06	43.11	46.00	44.16	44.16	43.59	42.89	42.54	44.16	45.01	46.60	45.02	46	42.32	42.89	39.57	32.68	58.91	38.44																			
3	42.32	42.20	39.57	32.68	58.91	38.44	43.06	43.19	46.77	44.16	44.16	43.59	42.89	42.54	44.16	45.02	46.66	45.02	46	42.32	42.62	35.54	32.68	60.44	38.44																			
4	42.32	42.62	35.54	32.68	60.44	38.44	43.55	43.03	46.19	44.16	44.16	43.59	42.89	42.54	44.16	45.01	46.38	45.02	46	42.32	42.59	39.54	32.68	59.51	38.44																			
5	42.32	42.59	39.54	32.68	59.51	38.44	42.60	42.00	46.06	44.16	44.16	43.59	42.89	42.54	44.16	45.00	46.35	45.02	46	42.32	42.63	35.55	32.68	55.01	38.44																			
6	42.32	42.63	35.55	32.68	55.01	38.44	42.70	42.96	46.11	44.16	44.16	43.59	42.89	42.54	44.16	45.01	46.49	45.02	46	42.32	42.64	35.54	32.68	51.38	38.44																			
7	42.32	42.64	35.54	32.68	51.38	38.44	42.60	42.96	46.86	44.16	44.16	43.59	42.89	42.54	44.16	45.01	46.47	45.02	46	42.32	42.20	39.59	32.68	50.75	38.44																			
8	42.32	42.20	39.59	32.68	50.75	38.44	42.27	42.76	44.90	44.16	44.16	43.48	42.75	42.48	44.16	44.96	44.33	45.02	46	42.32	42.53	38.44	32.68	42.42	38.44																			
9	42.32	42.53	38.44	32.68	42.42	38.44	41.69	42.86	45.72	44.16	44.16	43.34	42.65	42.40	44.16	44.95	44.00	45.02	46	42.32	42.11	39.40	32.68	37.04	38.44																			
10	42.32	42.11	39.40	32.68	37.04	38.44	41.54	42.39	42.45	44.16	44.16	44.11	43.20	42.68	42.37	44.16	44.93	43.85	45.02	46	Hour1	Hour2	Hour3	Hour4	Hour5	Hour6	Hour7	Hour8	Hour9	Hour10	Hour11	Hour12	Hour13	Hour14	Hour15	Hour16	Hour17	Hour18	Hour19	Hour20	Hour21	Hour22	Hour23	Hour24

When a user clicks on the buttons on the bottom of the table with text from "Hour1" to "Hour24", the single hour LMPs curve of all buses will be plotted, as shown in the following page. A user could choose the range of the buses to be displayed on the graph.



	01	02	03	04	05	06	07	08	09	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	24 Hours LMP
49	38.44	33.28	36.59	40.99	41.11	42.32	42.93	44.36	44.36	43.31	42.99	42.32	44.16	45.02	43.72	45.82	56.08	50.47	119.57	48.29	47.74	43.58	24h LMP1		
49	38.44	33.28	36.59	40.64	41.11	42.32	42.89	44.18	44.18	43.31	42.87	42.32	44.16	45.02	43.67	45.02	56.38	58.47	119.82	48.29	47.57	43.55	24h LMP2		
49	38.44	33.28	36.59	40.91	41.11	42.32	42.92	44.16	44.16	43.31	42.99	42.32	44.16	45.02	43.70	45.82	56.08	58.47	118.79	48.29	47.68	43.67	24h LMP3		
49	38.44	33.28	36.59	40.78	41.11	42.32	42.82	44.16	44.16	43.31	42.91	42.32	44.16	45.02	43.68	45.82	56.38	58.47	116.02	48.29	47.48	43.53	24h LMP4		
49	38.44	33.28	36.59	40.67	41.11	42.32	42.81	44.16	44.16	43.31	42.80	42.32	44.16	45.02	43.64	45.82	56.08	58.47	116.12	48.29	47.42	43.50	24h LMP5		
49	38.44	33.28	36.59	40.64	41.11	42.32	42.89	44.15	44.16	43.31	42.84	42.32	44.16	45.02	43.66	45.82	56.38	58.47	117.78	48.29	47.52	43.54	24h LMP6		
49	38.44	33.28	36.59	40.69	41.11	42.32	42.89	44.18	44.16	43.31	42.89	42.32	44.16	45.02	43.68	45.82	56.38	58.47	118.44	48.29	47.49	43.54	24h LMP7		
49	38.44	33.28	36.59	40.10	41.11	42.32	42.79	44.16	44.16	43.31	42.75	42.32	44.16	45.02	43.56	45.82	56.28	58.47	114.94	48.29	47.16	43.48	24h LMP8		
49	38.44	33.28	36.59	39.22	41.11	42.32	42.73	44.16	44.16	43.31	42.66	42.32	44.19	45.02	43.46	45.82	56.38	58.47	114.81	48.29	48.82	43.42	24h LMP9		
49	38.44	33.28	36.59	38.61	41.11	42.32	42.68	44.15	44.15	43.31	42.59	42.32	44.15	45.02	43.41	45.82	56.38	58.47	114.57	48.29	46.68	43.19	24h LMP10		

While when a user click on the "24h LMP" button at the end of each record as shown in the above page, the 24-hour LMPs curve of the chosen bus will be plotted, as shown in the following page.

