

# Load Flow Analysis

One Program, One Database, One Solution



**Voltage Drop**

**Power Factor Correction**

**Automatic Device Evaluation**

**Automatic Temperature Correction**

**2W & 3W Transformer LTC / Regulator Actions**

**Real & Reactive Power Losses**

**Auto-Run Based on System Changes**

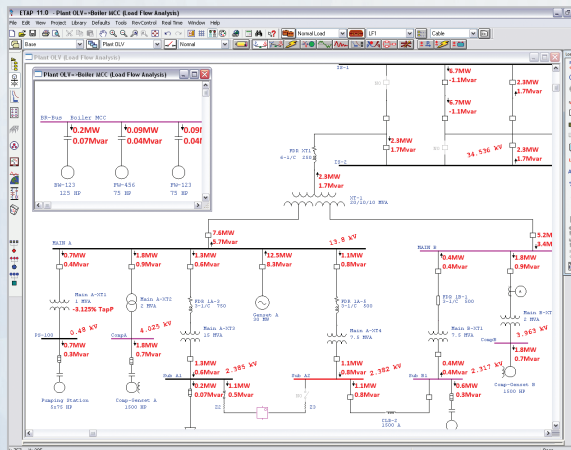
**Extensive Violation Alerts**

**Multi-Report Result Analyzer**

## Create & Validate System Models with Ease & Accuracy

With ETAP's advanced Load Flow module, you can create and validate your system model with ease and obtain accurate and reliable results. Built-in features like automatic device evaluation, summary alarms / warnings, result analyzer, and intelligent graphics make it the most efficient Load Flow program available today.

ETAP calculates bus voltages, branch power factors, currents, and power flows throughout the electrical system. ETAP allows for swing, voltage regulated, and unregulated power sources with multiple power grids and generator connections. It is capable of performing analysis on both radial and loop systems. ETAP allows you to select from several different methods in order to achieve the best calculation efficiency and accuracy.

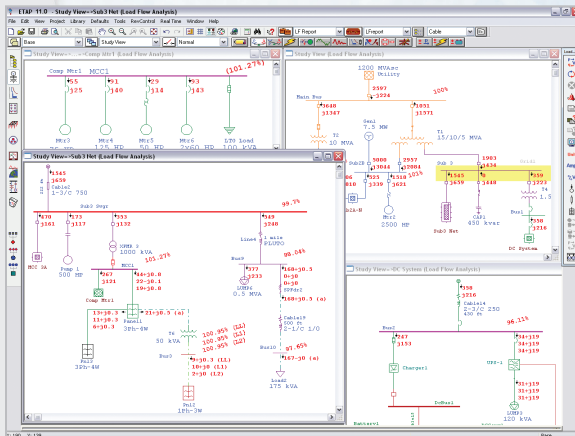


**Intelligent Graphics:** State-of-the-art graphical display of results including voltage drop, load terminal voltage, branch losses, and transformer LTC settings

# Most Efficient Load Flow Program Available

## Study Options

- Option to update initial conditions
- Phase-shifting transformers
- Auto-adjust LTC / regulator settings
- Power factor correction
- Saves solution control parameters for each scenario
- Make changes to your system & re-run studies instantly
- Conduct unlimited “what if” studies within one database
- Calculate bus voltages, currents, & power factors
- Bus / transformer / cable reactor overload warnings
- Calculate power flows
- Update loading for DC load flow
- Voltage drop calculations
- Five levels of automatic error checking



**3-Phase and 1-Phase Power Flow:** Calculate power flow for 3-phase, 1-phase, panel, and UPS systems simultaneously

## Capabilities

- Simulate multiple loading & generation conditions
- Automatically adjust transformer tap & LTC / regulator settings
- User-controlled convergence parameters
- Compare & analyze multiple reports using result analyzer
- Include effect of phase-shifting transformers
- View results graphically
- Evaluate critical & marginal limit violations
- Solve 3-phase & 1-phase system load flow simultaneously
- Isolated 1-phase source modeling

## Flexible Operation

- Diverse operating conditions
- Multiple loading categories
- Multiple demand factors
- Different model of lumped loading
- Unlimited configurations
- Different nameplate data
- Global & individual bus diversity factors

Critical Report							
Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Fuse3	Fuse	Overload	390.000	Amp	442.932	113.6	3-Phase
Sub3 Segr	Bus	Overload	225.000	Amp	233.625	103.8	3-Phase

Marginal Report							
Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus10	Bus	Under Voltage	2.402	kV	2.345	97.6	A
Bus2	Bus	Under Voltage	0.480	kV	0.461	96.1	3-Phase
MCC1	Bus	Over Voltage	0.480	kV	0.486	101.3	3-Phase
Sub22	Bus	Under Voltage	3.450	kV	3.324	96.4	3-Phase

Load Flow Analysis Alert View - Output Report: LFReport							
Study Case:	LF Report	Data Revision:		Base			
Configuration:	Normal	Date:		07/18/2008			
Critical							
Device ID	Type	Condition	Rating/Limit	Operating	% Operating	Phase Type	
Bus1	Bus	Under Voltage	0.48 kV	0.451	93.9	3-Phase	
Bus10	Bus	Under Voltage	2.402 kV	2.231	92.9	A	
Bus2	Bus	Under Voltage	0.48 kV	0.427	89.1	3-Phase	
		Under Voltage	4.16 kV	3.88	93.3	3-Phase	
		Overload	200 Amp	203.152	101.6	3-Phase	
		Overload	390 Amp	456.519	117.1	3-Phase	
		Over Exceeded	5.827 Mvar	5.827	100	3-Phase	
		Under Voltage	0.48 kV	0.445	92.8	3-Phase	
		Under Voltage	4.16 kV	3.943	94.8	3-Phase	
		Overload	225 Amp	236.195	105	3-Phase	
		Overload	12 MVA	12.5	104.2	3-Phase	
Marginal							
Condition	Rating/Limit	Operating	% Operating	Phase Type			
Under Voltage	0.48 kV	0.463	96.5	3-Phase			
Under Voltage	0.24 kV	0.23	96	L1			
Under Voltage	13.8 kV	13.471	97.6	3-Phase			
Over Voltage	13.8 kV	14.055	101.8	3-Phase			
Overload	175 Amp	154.14	88.1	3-Phase			
Under Voltage	0.48 kV	0.462	96.3	3-Phase			

**Automatic Device Evaluation:** Automatically generate critical and marginal alerts for overstressed 3-phase and 1-phase systems



# Simultaneous Analysis of Different Scenarios

## Load Flow Result Analyzer

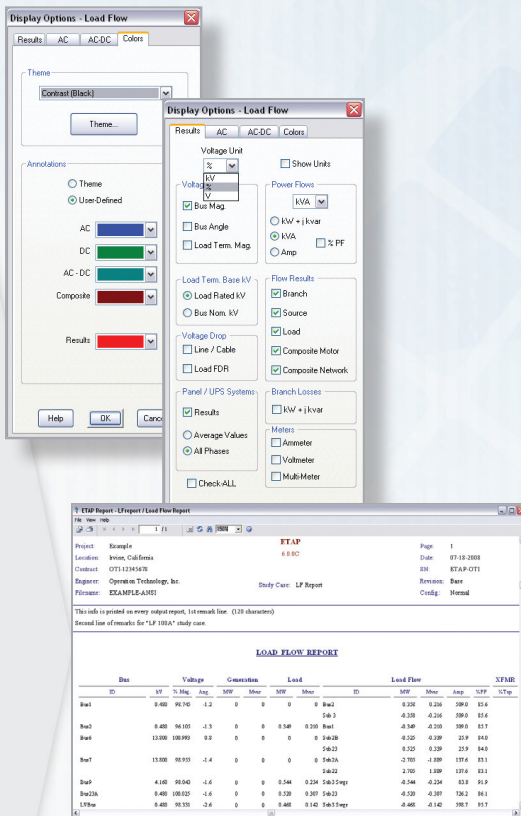
ETAP Load Flow Result Analyzer is a time-saving tool that compares and analyzes multiple reports in a single view. You can compare the results of general information about a project or more specific information such as the load flow results for buses, branches, loads, or sources.

The screenshot displays the Load Flow Result Analyzer software interface. The main window shows a table of results for various buses and loads across different load flow scenarios (Import, LF 80%, LF 100%, LF 150%, Maximum Load, Normal Load). The table includes columns for Bus ID, Voltage, and Maximum Load. A secondary window shows a bar chart titled 'Bus - CompA' comparing voltage levels for different scenarios. Another window shows a bar chart titled 'Study Scenarios' comparing % Loading for different units across scenarios. The interface also includes various filters and options for report generation and alert settings.

Bus ID	LF 80%	LF 100%	LF 150%	Maximum Load	Normal Load
100	2.39	2.372	2.306	2.357	
45	13.783	13.762	13.742	13.756	
51	35.454	35.201	34.51	35.011	
53	35.444	35.189	34.489	34.987	
74	13.814	13.8	13.8	13.8	
75	13.729	13.693	13.225	13.49	
76	13.57	13.392	12.514	13.257	
752	13.604	13.552	13.323	13.513	
787	13.73	13.594	13.226	13.491	
A	35.445	35.192	34.499	35.002	
Annex Bus	0.487	0.481	0.468	0.477	
Aux_AB	2.391	2.385	2.378	2.383	
B	35.445	35.192	34.499	35.002	
BR-Bus	0.475	0.474	0.468	0.473	
Bus 2C	13.606	13.555	13.326	13.516	
C	35.445	35.192	34.499	35.002	
CompA	4.096	4.073	4.026	4.059	
CompB	4.177	4.117	4.062	4.127	

- Understand results of multiple studies in one glance
- Compare & view multiple load flow results in a single view
- Analyze & compare reports from multiple projects
- Create a base line report & quickly identify deviations for all cases
- View multiple bus, branch, load, & source results
- Advanced alert & warning feature identifies & highlights overstressed components
- Easily find components on one-line diagrams from the analyzer view
- Export summary view into Microsoft® Excel for maximum data flexibility & visualization

# Detailed Modeling with Accurate Results



**Extensive Reporting:** Detailed load flow reports and indispensable summaries including branch losses, voltage drop, and loading

## Features

- Newton-Raphson, fast decoupled, & accelerated Gauss Seidel
- Generator governors with isochronous or droop mode
- Generator exciters with AVR or Mvar / PF controllers
- Transformer load tap changers (LTC / regulators)
- Advanced solution techniques for fast convergence
- Multiple loading conditions
- Multiple generation conditions
- Swing, voltage regulated, & unregulated power sources
- Voltage drop calculations
- Load forecasting
- Alert view to display critical & marginal limit violations
- Bus / transformer / cable overload warning
- Single-phase load flow display
- Global & individual bus diversity factors
- Individual demand factors for continuous, intermittent, & spare operating conditions
- Option to update the initial condition from load flow solutions
- Phase-shifting transformer
- Power factor correction
- Multi-report result analyzer
- Unlimited bus capability

## Reporting

- State-of-the-art graphic display of results
- Customize output reports using Crystal Reports®
- Generate output reports in any language
- Voltage drops, losses, power flows, power factor, etc.
- Input data, detailed load flows, & summaries
- Export reports to your favorite word processing program
- Graphically display device evaluation results
- Graphically display buses with marginal or critical under / over voltage
- Export one-line diagrams including results to third party CAD systems
- Alert view to display critical & marginal limit violations