# Unbalanced Load Flow

## Robust
## Reliable
## Accurate

A robust and efficient power flow solution method must be able to model special features of distribution systems with sufficient accuracy. With ETAP's Unbalanced Load Flow module, you can easily model your unbalanced system with detailed representation of component unsymmetrical characteristics. Accurate and reliable results are available describing your system's unbalanced operating conditions. Automatic alarm/warning and advanced features such as automatic line constant calculation make it the most advanced Unbalanced Load Flow program available today.

etap
Thinking Power
for Power Engineers

# Unbalanced Load Flow Analysis

## Key Features

**Unbalanced Power Flow**
**Phase & Sequence Voltage & Current**
**Voltage & Current Unbalance Factors**
**Demand Load Transmission Line Coupling**
**Voltage Drop Transmission Line Coupling**
**Power Factor Correction**
**Automatic Device Evaluation**
**Automatic Temperature Correction**
**Real & Reactive Power Losses**

## Study Options

- Option to update initial conditions
- Phase-shifting transformers
- Auto-adjust voltage regulator settings
- Power factor correction
- Save 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
- Voltage drop calculations
- Five levels of automatic error checking
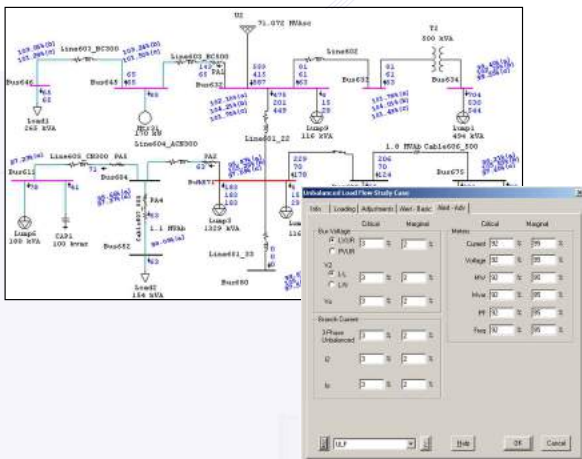


Unlimited Buses* & Elements
No Voltage Limitations
Looped & Radial Systems
Integrated 1-Phase & 3-Phase systems
Multiple Generators & Grid Connections
Multiple Isolated Sub-Systems
Customizable Libraries
Graphical Display of Results on One-Line Diagrams
Customizable Font Types, Sizes, Styles, & Colors
Customizable Display of Ratings & Results
Graphical Display of Equipment Impedance & Grounding
Automatic Error Checking
Graphical Display of Overstressed Devices
Graphical Display of Over/Under Voltage Buses
Dynamically Adjust Display of Results

**Design, Operation, Expansion**

## Capabilities

- Single-phase, two-phase (2W & 3W), three-phase (3W & 4W)
- Current-Injection method
- Unbalanced load modeling
- Unbalanced branch modeling
- Modeling of machine internal sequence impedances
- Model machine/transformer grounding impedance
- Modeling of transformer winding connections
- Automatic alert/warning for voltage & current unbalance rates
- Modeling of transmission line coupling between phases of one line & multiple lines
- Loads of constant power, constant impedance & constant current
- Generic load as function of voltage & frequency
- Generator governors with isochronous or droop mode
- Generator exciters with AVR or Mvar/PF control
- Transformer load tap changers (LTC/regulators)
- User-controlled convergence parameters
- Multiple loading conditions
- Advanced solution techniques for fast convergence
- Swing, voltage regulated, & unregulated power sources
- 10,000+ bus capability

## Flexible Operation

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

## Reporting

- Customize output reports using Crystal Reports®
- Generate output reports in any language
- Individual phase & sequence voltage, current, & power
- Voltage drops, losses, power flows, power factor, voltage/current unbalance factors, etc.
- Input data, detailed load flows, & summaries
- State-of-the-art graphic display of results
- 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