

INTRODUCTION

LINEAMPS is a complete system of rating overhead power lines, it is easy to use and is suitable for all regions, operating conditions and all transmission and distribution line voltages. Program has steady, dynamic, transient ampacity, and weather forecast models that provides power line ampacity from millisecond to seven days in advance. Weather data may be input in a number of ways – by user input, in real time from a weather service, or from the Internet. Program runs in Windows and is easily operated from a control panel (Fig. 1) comprising a menu system and icons.



Fig. 1

LINEAMPS is an integrated line ampacity system with user configurable power line, conductor and weather station database (Fig. 2) offering users easy access to the data stored in industry standard databases such as Microsoft ACCESS, SQL etc.

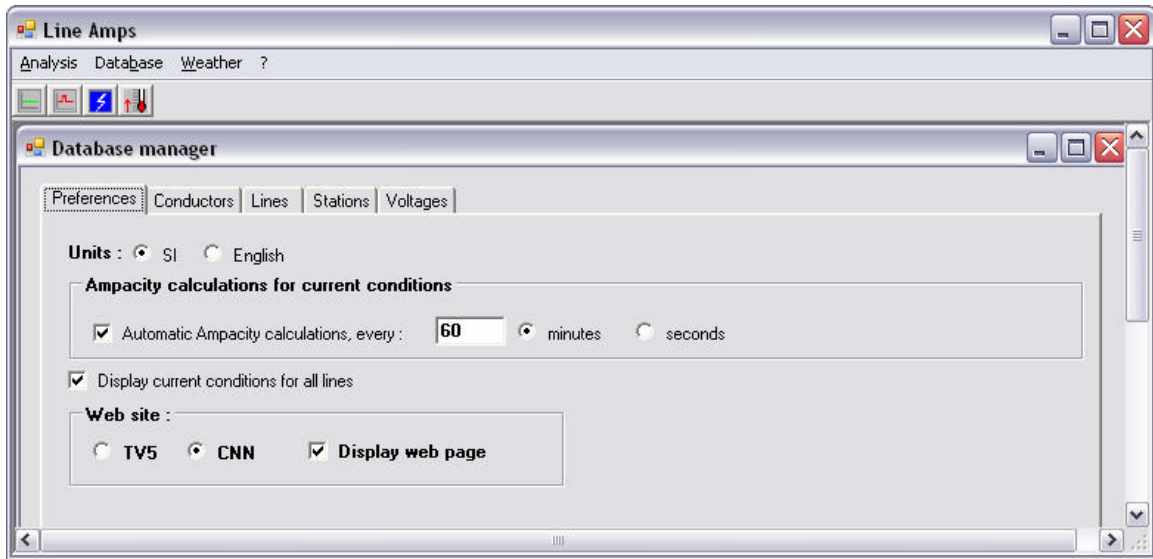


Fig. 2

Considers Transmission Line Terrain and Weather

Reliable estimates of power line ampacity are only possible when meteorological conditions and terrain are considered at different sites along the transmission line route. For this reason LINEAMPS power line object has a number of virtual weather sites situated along the line (Fig.3).

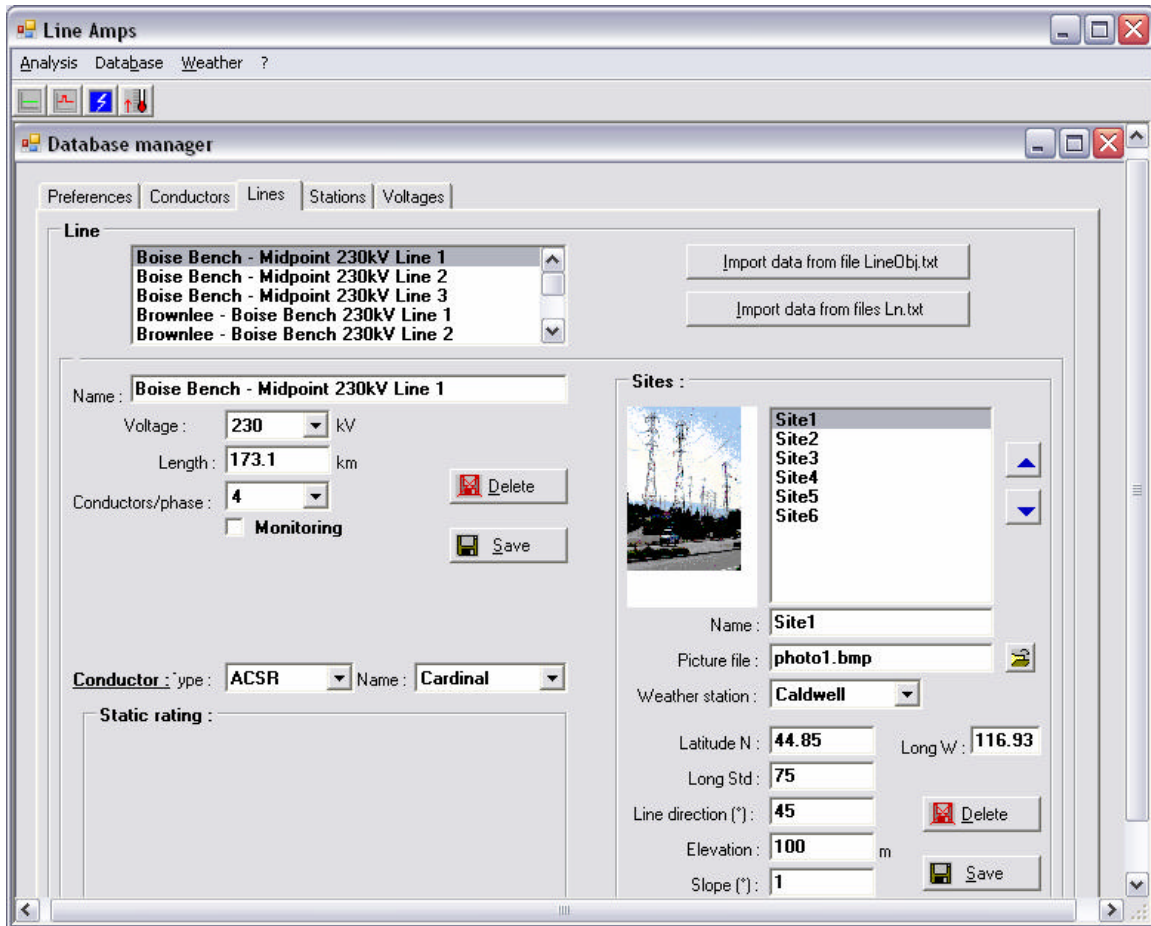


Fig. 3

Economical Line Ampacity System

The system is realized economically because it does not require real time meteorological data, conductor temperature measurements, conductor sag, conductor tension or any other real time data from external devices or systems on a continuous basis. The program generates its own weather data by using key weather information from general purpose weather forecast data input by the user. It is an economical line ampacity system that runs in a standard PC in the Windows environment.

EMS Connection

LINEAMPS can receive actual line current data and contingency plans automatically from an EMS for the calculation of conductor temperature, and allowable ampacity.

LINEAMPS Benefits

- ◆ Steady, dynamic and short-circuit ratings.
- ◆ Considers transmission line terrain.
- ◆ Forecast hourly ampacity up to seven days in advance.
- ◆ Generates synthetic weather data.
- ◆ Transmission line, conductor and weather station database.
- ◆ Input real time meteorological data automatically from the web
- ◆ Input real time conductor temperature or line current.

Steady State Analysis

The steady state analysis session window is used for the calculation of conductor current or temperature during steady state conditions (Fig. 4). As shown in the figure conductor data may be selected from a list of different types of conductors data or by selecting a line from the list of transmission lines stored in the database. Current weather conditions of the region are input automatically from the web. LineAmps provides a separate window for conducting steady state analysis.

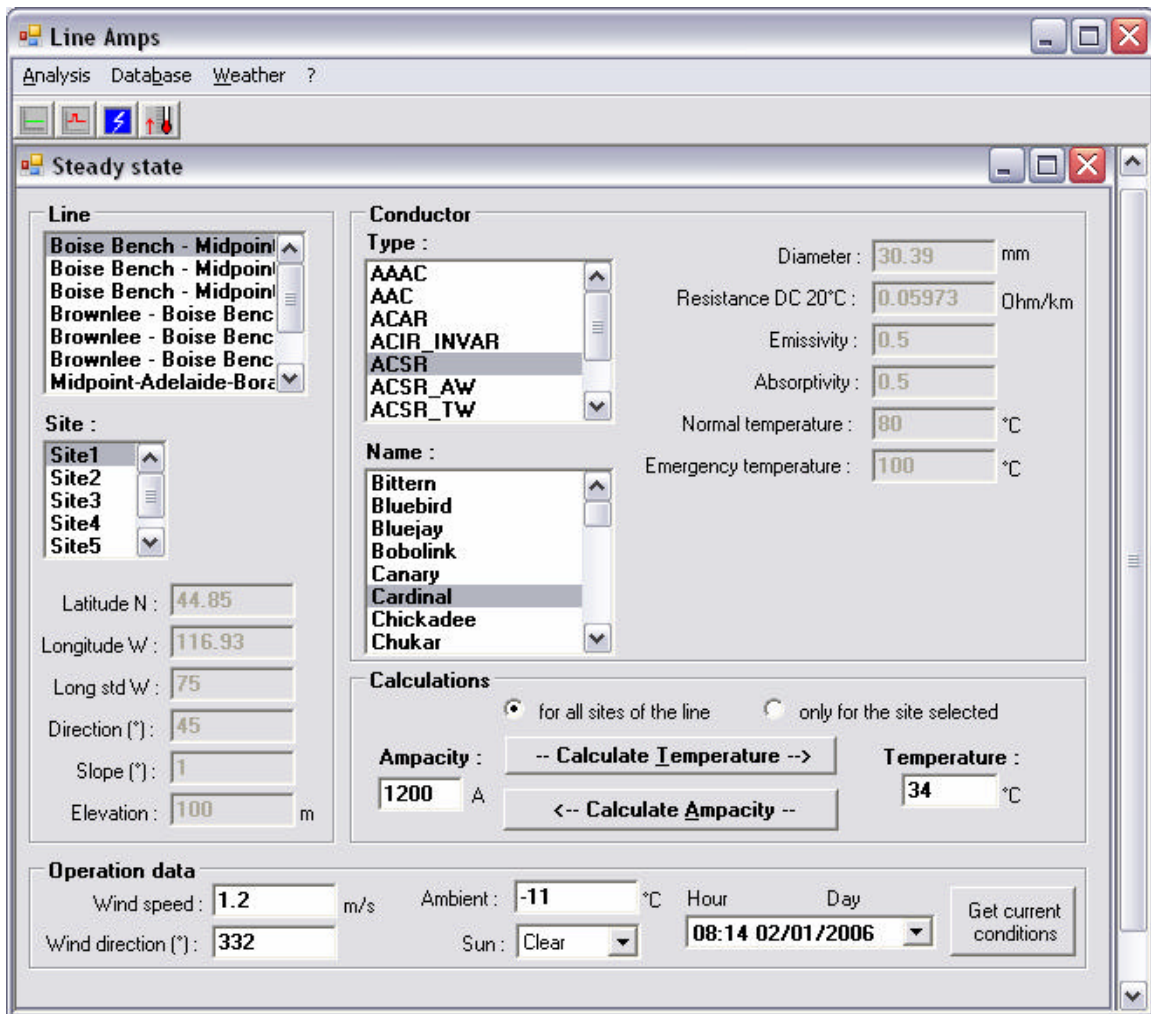


Fig. 4

Dynamic Analysis

Dynamic analysis is carried out to calculate the temperature response of a transmission line conductor due to a step change in current. A step change in line current may be due to line energization, short duration overload current during an emergency condition, or due to high starting current required to operate heavy electrical equipment. During these conditions higher than normal load current may be allowed for short duration by considering the heat capacity of conductors. LineAmps provides a separate window as shown in for conducting dynamic analysis.

As with steady state analysis mentioned above, conductor and transmission lines data for

dynamic analysis is input by simply selecting a conductor or a transmission line from the Dynamic Analysis Window and current weather conditions for the region is input automatically from the web. LineAmps provides a separate window for conducting dynamic analysis (Fig. 5).

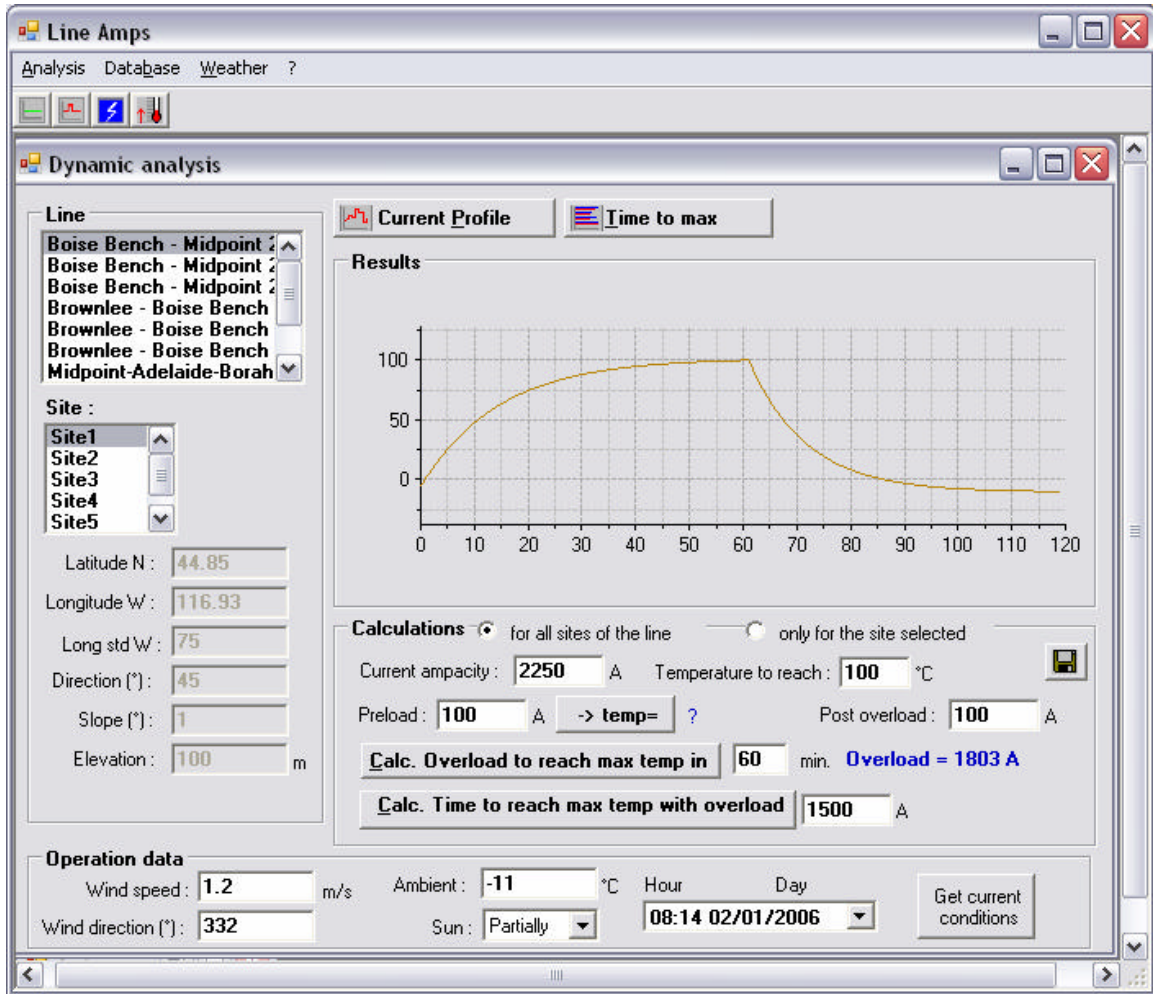


Fig. 5.

Short-Circuit Analysis

Short-Circuit analysis is carried out by LINEAMPS to calculate the temperature of a conductor due to high fault currents. Short duration fault currents due to short-circuit or lightning current or any operation that result in transient over current may overheat conductors which is easily analyzed by LineAmps. Transient analysis is generally carried out for durations less than 60 second. Modern protective devices eliminate faults in much less time and in most cases the fault duration is less than one second. The transient analysis window is used for evaluating conductor heating due to short duration very high line currents. As with steady state and dynamic analysis mentioned above, conductor and transmission lines data for transient analysis is input by simply selecting a conductor or a transmission line from the Dynamic Analysis Window and current weather conditions for the region is input automatically from the web. LineAmps provides a separate window for rapidly evaluating conductor temperature as a result of short-circuit currents (Fig.6).

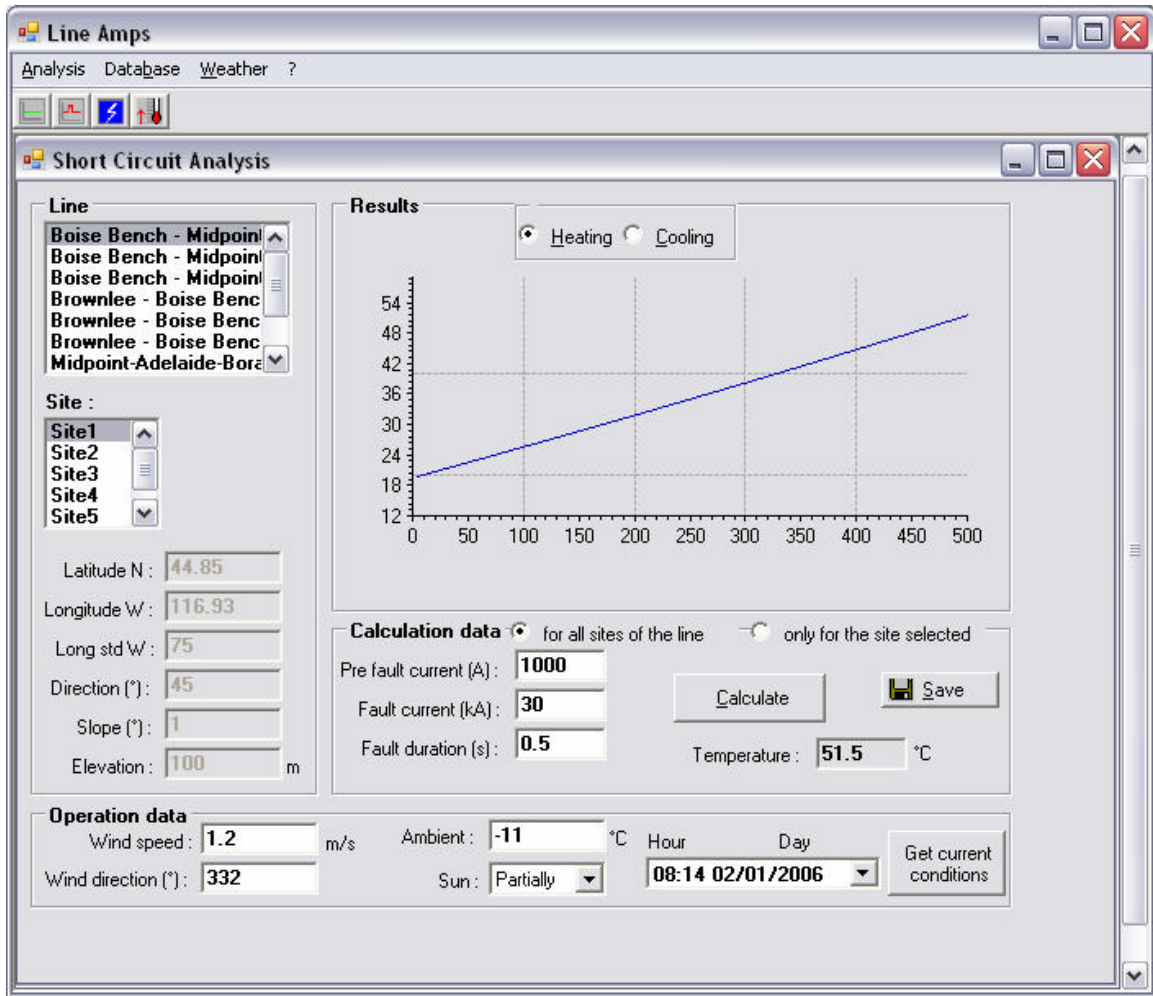


Fig. 6.

AUTOMATIC CALCULATIONS

In addition to performing steady, dynamic and short-circuit analysis LineAmps provides automatic line ampacity calculations at user specified intervals which may vary between hourly or half hourly calculations of steady state ampacity under normal and emergency conditions (Fig. 7) or time to reach critical temperature calculations that are performed more frequently in the order of seconds (Fig. 9).

Automatic Ampacity

Steady state ampacity calculations for normal and emergency conditions are updated automatically every hour or at any other user specified time interval by collecting latest weather data automatically from the web. An example of automatic steady state ampacity calculations is shown in Fig. 7, and the latest weather data acquired from the web is shown in Fig. 8.

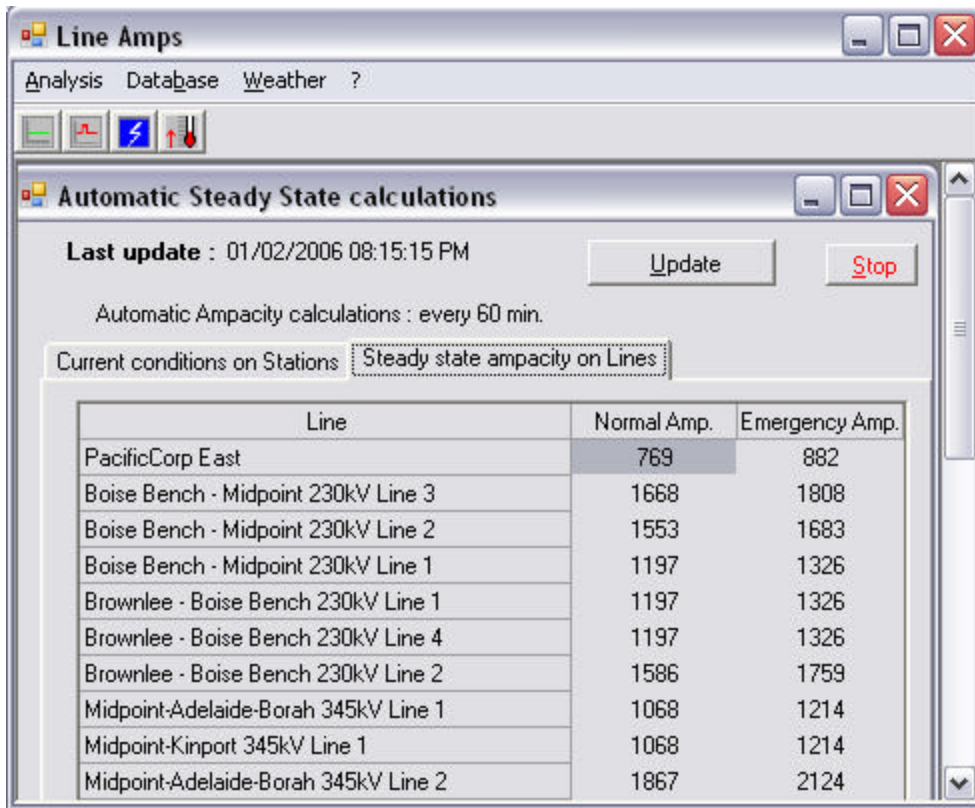


Fig. 7

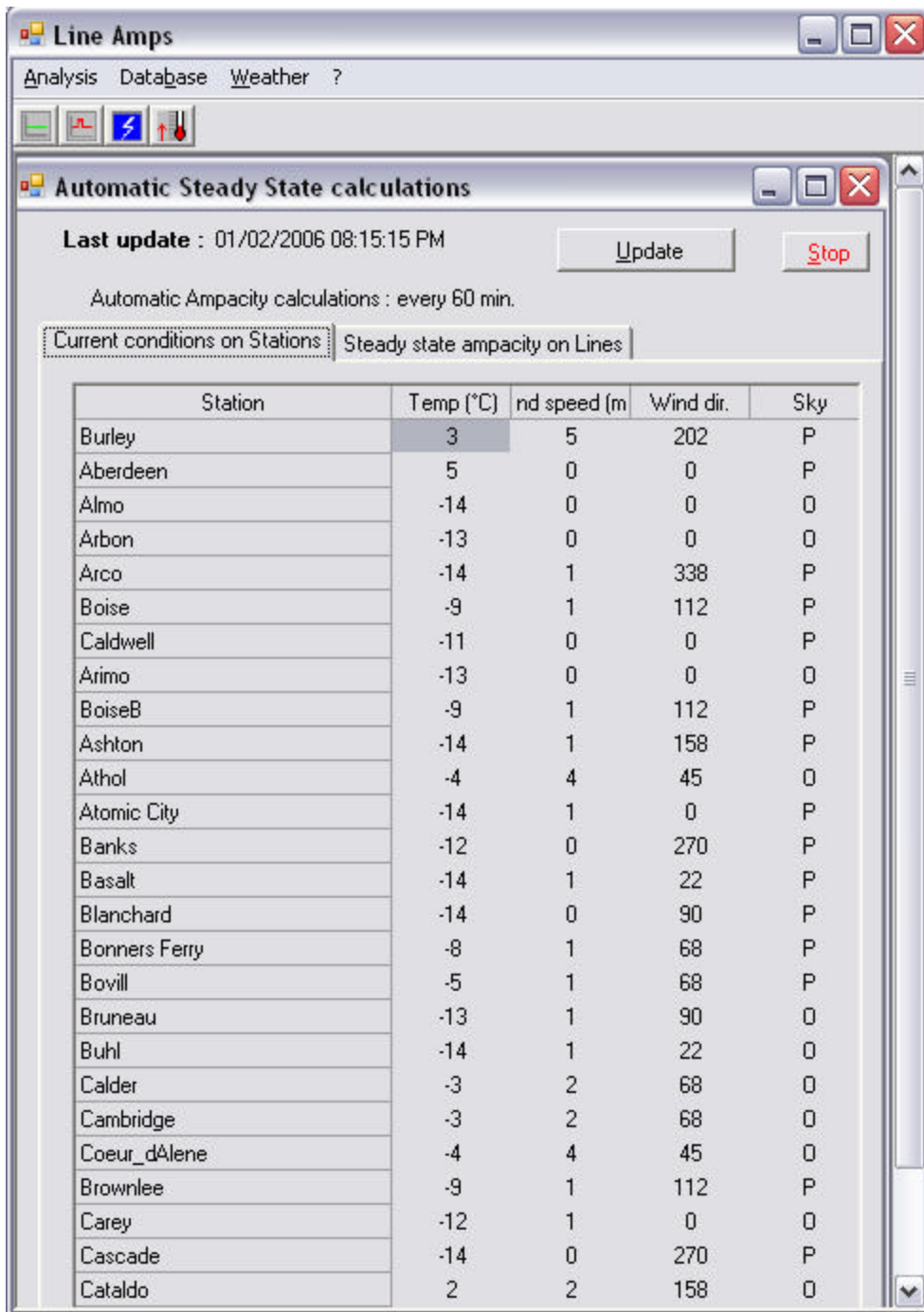


Fig. 8

Time To Reach Critical Temperature

When transmission lines are operating at high level of currents it is important for line operators to know not only the current temperature of the conductor under current weather conditions but also future evolution of conductor temperature and the time remaining to reach maximum permissible temperature of the line which we call the critical temperature. In other words, the operator is interested to know how long it will take for the conductor to reach maximum temperature at the present level of current passing through the conductor. LineAmps provides this information by continuously updating present and future conductor temperature calculations by acquiring latest weather information from the web or specified weather stations and by obtaining actual level of line current input from utility scada system.

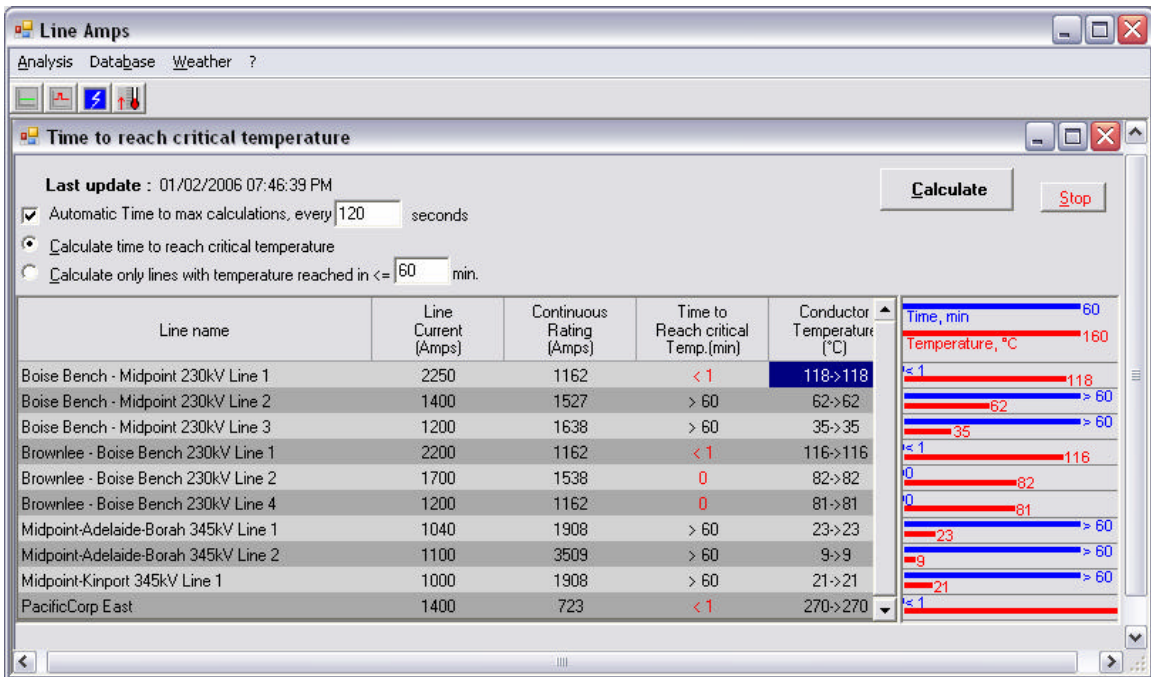


Fig. 9