

## Analysis of Voltage Quality Problems with NEPLAN®

<b>Challenges</b>	Integration of dispersed generation
<b>Customer</b>	Distribution system utilities
<b>Advantages</b>	Assessment based on technical rules / standards Simple and quick action, user-friendly graphical interface
<b>Solution</b>	The various topics of voltage quality are analyzed with up-to-date and user-friendly calculation modules.

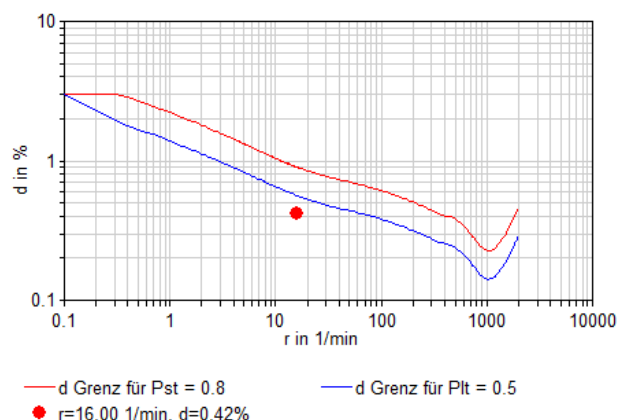
The following causes are often responsible for a decreasing voltage quality in an electrical energy supply network:

- Decreasing short circuit power
- Increase in consumers and generators with power electronic devices
- Decrease in network damping

In various standards, such as in EN 50160, limits are defined for the voltage quality. NEPLAN offers several analysis methods for these requirements.

### Flicker

The flicker evaluation is available in both, in the Connection Request module and generally in NEPLAN for supply and load elements.

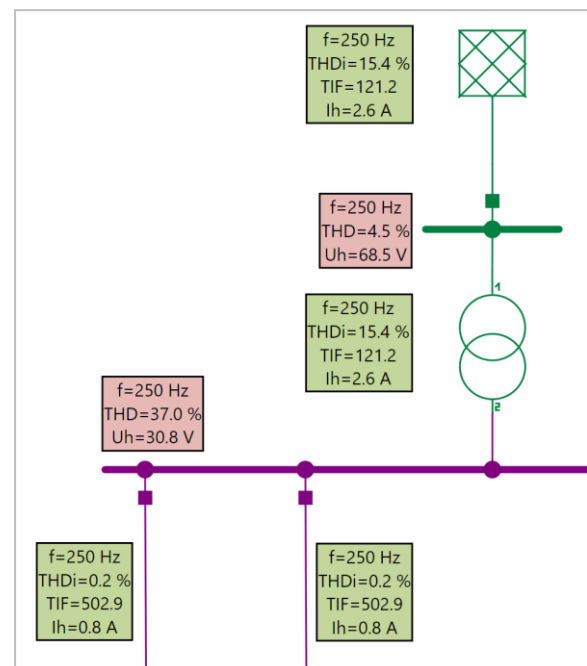


Flicker limit curves and operating point of a device

### Harmonics

Power electronics can negatively affect the voltage quality of the networks in many ways, e.g. by emitting currents of different frequencies and thus stimulating existing resonant circuits in the network, or by contributing to new resonants.

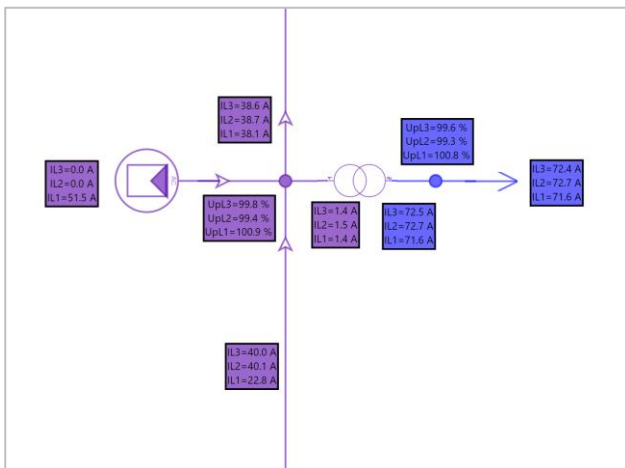
The NEPLAN Harmonics module provides the user with a proven and powerful tool to analyze and solve harmonic distortion problems.



Effects of harmonics on the feeding network: currents and voltages of the 5th harmonic, THD and THDi

## Voltage Unbalance

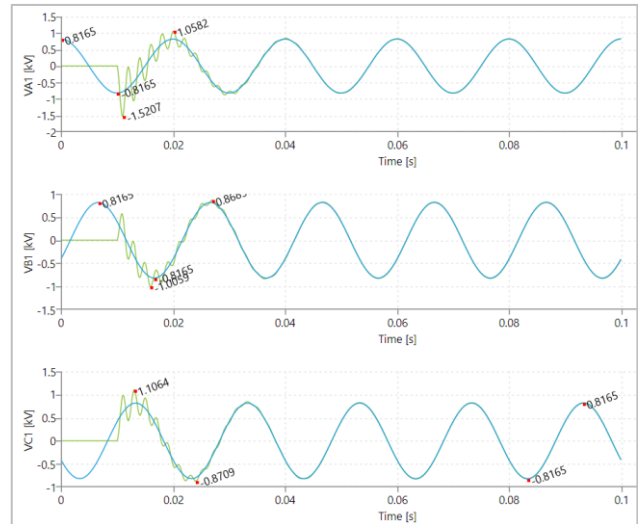
The load flow calculation analyzes not only symmetrical but also unbalanced networks. So, you can easily investigate the effects of unbalanced generators or consumers and, if necessary, simulate remedial measures.



Unbalanced load flow – network with single phase connected photovoltaic device

## Transient Overvoltages

Transient effects, such as those occurring during switching, can lead to voltage quality problems. NEPLAN offers a powerful tool with the Dynamic Analysis module.



Transient overvoltage after a switching action, simulated with the Dynamic Simulation module