OpenPowerNet

Release Notes Version 1.5.8

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1 Introduction

1.1 Overview

The purpose of this document is to describe the changes and the status of OpenPowerNet version 1.5.8. The document contains:

- List of delivered files on DVD,
- Description of the main functionality,
- Any restrictions known,
- List of corresponding documentation and
- Known issues.

1.2 Configuration

See document Installation Instruction version 1.5.8 for required third-party software versions.

1.3 Acronyms and abbreviations

The following abbreviations are used within this document.

Abbreviation	Description
2AC	2 Phase AC
AC	Alternating Current
ATM	Advance Train Module
DC	Direct Current
DVD	Digital Versatile Disk
GUI	Graphical User Interface
ODBC	Open Database Connectivity
PSC	Power Supply Calculation

2 List of files on DVD delivery

```
OPN_InstallationInstruction_1.5.8.pdf
OPN_ReleaseNotes_1.5.8.pdf
OPN_UserManual_1.5.8.pdf
OpenPowerNet\my.ini
OpenPowerNet\createUser.bat
OpenPowerNet\OpenPowerNet-1.5.8.zip
OpenTrack\OpenTrack.V_1.8.2.2015-11-17.zip
ThirdPartyPrograms\ required by OpenPowerNet, see Installation Instructions
update\
```

3   Main functionality

OpenPowerNet version 1.5.8 has the following main functionality:

- Calculation of AC, 2AC and DC power supply system,
- Calculation of magnetic coupling of conductors is done internally,
- AC / 2AC power supply models:
- Transformer,
- Auto transformer,
- Booster transformer,
- DC power supply models:
- Rectifier,
- Energy storage for stabilisation of line voltage and energy saving
- Voltage limiting device model to limit the touch voltage.
- Calculation of tractive effort with retroactive effect to the railway operation simulator OpenTrack,
- Calculation regenerative braking,
- Consideration of tractive and braking current limitation,
- Consideration of power factor at vehicle pantograph,
- Calculation of electrical engines with single or multiple propulsion systems,
- Division of power consumption for multiple Train Operating Companies,
- Evaluation of engine energy storage,
- Consideration of coasting behaviour of the courses,
- Consideration of changing train mass at station stops,
- Calculation of short circuit currents,
- Quick evaluation of network structure using constant current engine model,
- Visualisation of results using prepared Excel-Files and
- Visualisation of results using the automated analysis of the Analysis Tool generating Excel and PDF files for:
- Minimum pantograph voltage,
- Maximum touch voltage,
- Maximum leakage current,
- Substation:
- Feeder current versus time and as TRLPC[1],
- Busbar voltage versus time
- Power (P,Q,S) versus time and as TRLPC for input, output and total (per substation and total of all substations of a network),
- Power factor versus time

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[1] The **T**ime-**R**ated **L**oad **P**eriods **C**urve (TRLPC) shows the maximum or minimum of a set of varying window-size averages where the window time duration is defined by the x-axis value.

- Magnetic Field as flux density (B-field) and field strength (H-field),
- Conductor and connector current versus time and as TRLPC[1]
- Voltage versus time and as TRLPC[1]
- Energy overview
- Vehicle specific overview

4   Changes since version 1.5.7

- **General:**
  - Add support for Windows 10.
  - Add prepared Excel file "Voltage, U=f(t)".
  - Add tutorial for mixed electric + diesel hauled trains.
  - bugfix op173: None existing OT engine in OPN with name containing % lead to crash of OPN. Fixed.
- **ATM:**
  - bugfix op202: Auxiliary power was not reduced in case of 0A current limit at 0km/h.
  - bugfix op234: In some rare circumstances the DC ATM-PSC iteration was terminated but having excessively high voltages while recovering. The recovering current was very low thus the calculated energy was still OK but the voltage level was a way too high.
- **PSC:**
  - bugfix op482: Drop simulation did not enable keys before drop the simulation. In case the simulation did not finish correctly the drop operation could take very long time. Now it is checked for disabled keys and in case there are any disabled keys they get enabled.
- **Analysis:**
  - Added support for Excel 2016.
  - Output for lines: Added chart type I_Conductor = f(s).
  - Output for lines: Added possibility to create chart series for minimum or maximum average signals (mean or rms) along the line with selectable time base. This works for all conductor items, but not voltage at vehicle pantographs. If the same function is applied to all selected items in the chart, the function will be shown in the chart title instead of the item name (like with shared line and track names).
  - Output for lines, pantograph voltage: Built in additional filter for pantograph voltage: If travelling distance per timestep of a minimum (or maximum) voltage engine is very high compared to the slice distance and there are engines with higher voltage level, multiple upward (or downward) peaks might be seen in the resulting minimum (or maximum) signal. These peaks are filtered now carefully to get a nicer chart. The extreme values are always kept.
  - bugfix: Excel output creation should now be more robust in case the user is starting new Excel instances during runtime. (Excel 2013 or higher)
  - bugfix: Increased performance of TRLPC calculation. Also fixed an error in calculation of minimum RMS values ("U = TRLPC_min" for "Voltages") which would lead to higher values in the total chart of simulations with multiple simulation time windows. The single charts per time window were correct though.

- bugfix: Fixed output for lines (pantograph voltage) for different conductor names along the line. Also fixed handling of conductor definitions with mixed positions and improved performance.
- bugfix: Output for lines, pantograph voltage: Fixed database query for maximum pantograph voltage which would pick the minimum of multiple values at the exact same pantograph (not slice) position.
- bugfix: Output for lines: Handle missing reference item selection.
- bugfix: Output for connectors: Fixed calculation of losses for P = f(t) and P = TRLPC charts which leads to slightly different values for AC networks depending on the current angle. Connectors in substation and energy calculation are not affected.
- bugfix: Refined message for unhandled exceptions.

5 Known restrictions

OpenPowerNet is tested with OpenTrack version 1.8.2 (2015-11-17) and should only be used with this version.

OpenPowerNet is a single user application. It is not tested to use the same database for multiple users at the same time.

The Engine-File uses the RailML rollingstock schema version 1.03 with OpenPowerNet specific extensions and is therefore not 100% compatible with the mentioned version 1.03.

6 Version of corresponding documentation

The following table lists the version of the documents related to OpenPowerNet 1.5.8.

Document	Version
Installation Instruction	1.5.8
User Manual	1.5.8

7 Known issues

The following table contains all known but unsolved issues.

ID	Summary	Status
371	When using larger time steps other than 1s, OpenTrack sends the requests not for all courses in the same time raster but OpenPowerNet is designed to calculate always in the same time raster. Workaround 1: Use always 1s simulation time steps. Workaround 2: Set all times within OpenTrack in the raster according to the selected simulation time step, e.g. for 3s time step only time hh:mm:00, hh:mm:03, hh:mm:06 ….. The simulation will be terminated by OpenPowerNet in case of OpenTrack requests outside of the time raster.	Can't be solved.
458	The information of split, merged and connected courses is not available in OpenPowerNet. Therefore the engine energy storage of an engine will be reset to the initial values even if the new course is connected with the previous course and the two courses represent the same physical train.	Open
582	Creation of magnetic field image needs the desired character set to	Open

| be used for output set as system locale as Matlab plot functions do not handle unicode characters. | |