

OpenPowerNet

Release Notes Version 1.7.0

Institut für Bahntechnik GmbH
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Document No. OPN/RN/1.7.0

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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 1.7.0. 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 1.7.0 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

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OPN_InstallationInstruction_1.7.0.pdf
OPN_ReleaseNotes_1.7.0.pdf
OPN_UserManual_1.7.0.pdf
OpenPowerNet\my.ini
OpenPowerNet\createUser.bat
OpenPowerNet\OpenPowerNet-1.7.0.zip
OpenTrack\OpenTrack.V_1.8.4.2017-06-06.zip
ThirdPartyPrograms\ required by OpenPowerNet, see Installation Instructions
update\

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OPN/RN/	 OpenPowerNet	 Institut für Bahntechnik GmbH
Page 3 of 6	Release Notes Version 1.7.0	Issue 2017-06-22

3 Main functionality

OpenPowerNet version 1.7.0 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,
 - Converter (SFC),
 - Auto transformer,
 - Booster transformer,
- DC power supply models:
 - Rectifier/Inverter,
- 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 TRLPC¹,
 - 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,
 - Magnetic Field as flux density (B-field) and field strength (H-field),

¹ The **Time-Rated Load Periods Curve** (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.

OPN/RN/		
Page 4 of 6	Release Notes Version 1.7.0	Issue 2017-06-22

- Conductor and connector current versus time and as TRLPC¹,
- Voltage versus time and as TRLPC¹,
- Energy overview,
- Vehicle specific charts,
- Vehicle specific overview

4 Changes since version 1.6.1.1

- General:
 - New Model viewer, called “Network Model Microscopic Viewer” (NMMV).
 - Significant simulation speedup for models with SFC.
 - Additional output by Automatic Analysis.
 - Number of bugfixes in Engine Editor.
 - Added AC 12 kV 25 Hz supply system.
 - Updated User Manual.
- Analysis:
 - Create chart output for conductor current sums. All selected items for a chart will be summed up and drawn as single chart series (separate chart series for min/max selection).
 - Added option to decide for networks with individual time window definition whether to create output for global and/or individual time definitions.
 - Improved error handling and handling of invalid selections so that some of the remaining output can be created despite of an error.
 - Vehicle output:
 - Create aggregated chart series for all courses in a single datasheet for highly improved performance and to omit chart series limit (maximum of 255 series per chart).
 - Added time outside of electrical network corridor to overview table.
 - Added chart output for phi in deg, F_achieved-F_Propulsion, eta_Panto (eta_Traction*eta_Transformer), eta = f(I), losses and SoC of energy storage.
 - Removed degree of energy at pantograph against nominal voltage for consumption and recovery.
 - Transportation quantity (TKT) is now calculated from travelled distance instead of speed. This is more accurate, but will lead to slightly different values for TKT and E_specific in the vehicle overview.
 - Energy overview:
 - Added energy consumed by vehicle brake resistors to overview table. Please note that this is disabled by default and may be enabled by setting the attribute "use" to true in a customised preset file under TableTypes/Energy/TableRow/Section[Vehicle]/Row[E_BrakeResistor].
 - Substation output:
 - Create output for power of autotransformer according to EN 50329: S/P/Q renamed to S_E/P_E/Q_E, output will be created for OCS-Rails by default. Rails-NF may be enabled in custom preset file by setting attribute "use" to true for the "Device2" items in chart types "P_AT = f(s)" and "P_AT = TRLPC". Values not visible in charts will be written to data tables nevertheless. The device overview will show the different values as "signals". Also added

S_N/P_N/Q_N (rated power according to EN 50329). Please see User Manual FAQ for description.

- Added optional possibility to create the following variables in device overviews: S_rms, Q_rms, S_rmsSel, Q_rmsSel, E_Q. To create the output, the attribute "use" has to be set to true in a customised preset file for the corresponding column items under TableTypes/Substations/TableType/Section[Device]. The timeBase value of the "rmsSel" variables (default 15 minutes) may be modified through attribute "selectionValue".
- Added aggregated output for individual network time windows.
- Removed output of apparent power S at devices for out/in signals (charts and overviews). The values for reactive power Q are now found by evaluating the sign of Q instead of current sign.
- Lines output:
 - The chart title, item and file names include the common line and track ID from the selection. This is now taken from the selection items only, reference items are ignored. In particular, this is useful when creating e.g. charts for rail-earth potential: If separate charts are to be created for each rail conductor, the naming was different previously due to the "earth" being bound to either track.
 - Display a warning if output file is skipped (e.g. if timbase value too big).
- Default layout via Preset
 - Changed default axes for power charts to AC formatting (SPQ) to be able to create some useful output for power supply systems without an own System preset. Also added SPQ axis setup for chart of losses in device (converter and autotransformer).
- Number of bugfixes.

5 Known restrictions

OpenPowerNet is tested with OpenTrack version 1.8.4 (2017-06-06) 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.

6 Version of corresponding documentation



The following table lists the version of the documents related to OpenPowerNet 1.7.0.

Document	Version
Installation Instruction	1.7.0
User Manual	1.7.0

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	Can't be solved.

OPN/RN/		
Page 6 of 6	Release Notes Version 1.7.0	Issue 2017-06-22
	<p>raster but OpenPowerNet is designed to calculate always in the same time raster.</p> <p>Workaround 1: Use always 1s simulation time steps.</p> <p>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</p> <p>The simulation will be terminated by OpenPowerNet in case of OpenTrack requests outside of the time raster.</p>	
458	<p>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.</p>	Open
582	<p>Creation of magnetic field image needs the desired character set to be used for output set as system locale as Matlab plot functions do not handle unicode characters.</p>	Can't be solved.