

OpenPowerNet

Release Notes Version 1.5.1

Institut für Bahntechnik GmbH
Branch Office Dresden

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Author	Review	Release
_____	_____	_____
Date	Date	Date
Martin Jacob	Harald Scheiner	Dr. Jörg von Lingen

1 Introduction

1.1 Overview

The purpose of this document is to describe the changes and the status of OpenPowerNet version 1.5.1. 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 1.5.1 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_1.5.1.pdf
 OPN_ReleaseNotes_1.5.1.pdf
 OPN_UserManual_1.5.1.pdf
 OpenPowerNet\my.ini
 OpenPowerNet\createUser.bat
 OpenPowerNet\OpenPowerNet-1.5.1.zip
 OpenTrack\OpenTrack.V_1.7.4.2013-11-28.zip
 ThirdPartyPrograms\ required by OpenPowerNet, see Installation Instructions
 update\



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3 Main functionality

OpenPowerNet version 1.5.1 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 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 **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.

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

4 Changes since version 1.5.0

- **General:**

- It is now possible to delay the acceleration of engines after energization, e.g. when line power resumes after a failure, by a delay distribution to model the individual driver behaviour. The delay is only active for engines with main switch on. The main switch is operated by OpenTrack Power Signals. The delay duration is defined by a distribution, see user manual chapter 4.3.5.11. The delay is enabled if attribute `accelerationDelayAfterEnergization` is defined at element `OpenPowerNet`. The delay distribution of a simulation is visualized by the prepared Excel File `EngineDelay.xlsx`.
- OpenTrack updated to 1.7.4 (2014-02-05).

- **Database:**

- Add table `engineDelay` → database version changed to 18.

- **ATM:**



- Bugfix: Auxiliary data have not been recorded for the first time step an engine left an electrified section. This causes the vehicle analysis to abort.

- **PSC:**

- Relax model checking for DC models:
 - equivalent radius is not mandatory (PRJ-E-028)
 - x and y position is optional and multiple conductors at same position is allowed (PRJ-E-081, PRJ-E-084)
 - `z_imag_Ohm` optional for:
 - power supply to busbar
 - connector
- Add switch for line connector.
- Speed up DC matrix calculation.
- Speed up current and voltage recording, now use of dump does not give advantage for time to run a simulation. A new PSC property is the maximum allocable RAM, this controls the size of the recording buffer.
- Bugfix: Current of `U_source` or `short_circuit` engine could be calculated as 0 A in some special cases with multiple networks.

- **GUI:**

- Selection Editor:
 - Setting various default values.
 - Add "file production mode" selector for substations to allow splitting of output files.
- bugfixes:
 - GUI did not remember recent workspace.
 - PSC Viewer did not use the defined time.

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- Selection Editor: Sometimes designation was not saved for Lines and Connections.
- Selection Editor: Sometimes the filling the simulations combo box failed.
- Selection Editor: Time combo boxes have not displayed more than 65000 entries.
- **Excel Analysis:**
 - EnginesAll.xlsx: Now 9h are available to select a time window.
 - Add EngineDelay.xlsx
- **Analysis Tool:**
 - Charts f(t):
 - Added possibility to limit the timesteps in a single chart. This can be configured in preset under element `xAxis`, attribute `valueMax`. Input format is 'hh:mm:ss' or days, default is 3 hours. The chart will be split automatically if output has too many timesteps.
 - When creating charts for more than 24 h, the day is added to the number format of the x-axis and the subtitle.
 - Charts for DC substation: Added possibility to create output for current of busbars, feeders, rectifier and energy storage without calculation of absolute values. This can be enabled in a custom preset file: For busbar and feeder output set the attribute "use" of the items `I_Busbar` and `I_Feeder` to true and for device set use of `I_BusbarOCS` to true. Set the corresponding `_abs` items to false to prevent duplicate output. For AC networks the absolute items will always be used.
 - Charts for line: Added handling of multiple contact wire and rail conductor definitions with different conductor names. This leads to different colours for each conductor definition, e.g. per section. Please enhance the preset if necessary! Also note the maximum of 1 contact wire and 2 rails per track at each slice for the simulation!
 - Charts for substation: Added selection option "file production mode" to allow splitting of the output files. This should help to keep the file size smaller for big projects.
 - Major performance improvement for creation of line and substation charts, primarily for very big simulations.
 - Calculation of TRLPC: Now allows more than 86400 timesteps (up to 1 year with 1 s timestep).
 - Inline conductor voltage: If multiple reference items are selected, output is now generated only for first item on same track or line.
 - Fixed magnetic field image: Axis title could overlap position plot.
 - Charts for connector: Create name out of ID if not configured in project file.
 - Vehicles overview: Correct handling of variable mass factor for transportation quantity.
 - Substation device overview: Fixed typo in preset file for unit of `P_abs_max`.
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5 Known restrictions

OpenPowerNet is tested with OpenTrack version 1.7.4 (2014-02-05) 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 1.5.1.

Document	Version
Installation Instruction	1.5.1
User Manual	1.5.1

7 Known issues

The following table contains all known but unsolved issues.

ID	Summary	Status
371	<p>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.</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>	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 be used for output set as system locale as Matlab plot functions do not handle unicode characters.	Open