**OpenStudio Version 3.0.0**

*Release Notes*

*4/24/2020*

These release notes describe version 3.0.0 of the OpenStudio SDK developed by the National Renewable Energy Laboratory (NREL), Buildings and Thermal Systems, Commercial Buildings Research Group, Tools Development Section, and associated collaborators. The notes are organized into the following sections:

• Overview

• Where to Find OpenStudio Documentation

• Installation Notes

• OpenStudio SDK: Changelog

**Overview**

Following an important announcement related to future development of the Open- Studio Application released in September 2019 (A Shift in BTO’s BEM Strategy: A New Future for the OpenStudio Application), **this release marks the first installment of the separated OpenStudio SDK from the Application.** Going forward, the SDK will continue to be distributed and released two times per year, in April and October. Development of the OpenStudioApplication has been moved to its own NREL/OpenStudioApplication GitHub.

Below is the list of components that is included in this SDK installer:

**OpenStudio SDK 3.0.0** - EnergyPlus - Command Line Interface (CLI) - Radiance - Ruby API - C++ SDK

**Note** that PAT is not included in either the SDK or Application installers. You will need to install PAT separately which is distributed on the OpenStudio-PAT GitHub page.

**Long-Term Support of 2.x version: 2.9.X-LTS**

This new major release is bringing a lot of changes not the least of which is the separation of the OpenStudioApplication as well as some API breaking changes. Only critical bug-fixes will be implemented in the LTS branch and no new features will be developed. The supported EnergyPlus version will remain 9.2.0 in the LTS branch. We encourage users to transition to the 3.x version of OpenStudio.

**Where to Find OpenStudio Documentation**

• OpenStudio release documentation, including these release notes, tutorials, and other user documentation, is available at https://www.openstudio.net/

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• C++ API documentation is available at https://openstudio-sdk- documentation.s3.amazonaws.com/index.html

• Measure development documentation is available at http://nrel.github.io/ OpenStudio-user-documentation/reference/measure\_writing\_guide/

• A roadmap for planned features is available at http://nrel.github.io/OpenStudio- user-documentation/getting\_started/roadmap/.

**Installation Notes**

OpenStudio 3.0.0 is supported on 64-bit Windows 7 – 10, OS X 10.12 – 10.15, and Ubuntu 18.04.

OpenStudio 3.0.0 supports EnergyPlus Release 9.3, which is bundled with the OpenStudio installer. It is no longer necessary to download and install Energy- Plus separately. Other builds of EnergyPlus are not supported by OpenStudio 3.0.0.

OpenStudio 3.0.0 supports Radiance 5.0.a.12, which is bundled with the OpenStu- dio installer; users no longer must install Radiance separately, and OpenStudio will use the included Radiance version regardless of any other versions that may be installed on the system. Other builds of Radiance are not supported by OpenStudio 3.0.0.

OpenStudio 3.x now uses **Ruby 2.5.5** as the supported version (2.2.4 previously).

As usual, you can refer to the **OpenStudio Compatibility Matrix** for more information.

**Installation Steps**

• Download and install OpenStudio SDK and/or [OpenStudioApplication]( depending on your needs. Select components for installation. Note that OpenStudio Application is a standalone app and does not require you to install OpenStudio SDK.

• Setup a Building Component Library (BCL) account to access online building components and measures. View instructions on how to setup your account and configure the key in OpenStudio.

• The OpenStudio Application SketchUp Plug-in requires SketchUp 2019 (not available for Linux). The OpenStudio Application SketchUp Plug-in does not support older versions of SketchUp. SketchUp must be installed before OpenStudio Application to automatically activate the plugin. If you install SketchUp after OpenStudio Application, simply rerun the OpenStudio Application installer.

For help with common installation problems please visit, http://nrel.github.io/OpenStudio- user- documentation/help/troubleshooting/.

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**OpenStudio SDK: Changelog**

The 3.0.0 is a major release The 3.0.0 release updates OpenStudio to use Energy- Plus 9.3. This update includes several new features, performance improvements, and bug fixes. You can find the list of Pull Requests that got into this release here.

**New Features, Major Fixes and API-breaking changes**

A number of API-breaking changes have been implemented in OpenStudio 3.0:

• Updated EnergyPlus from v9.2.0 to v9.3.0

• (#3044) Added support for FanSystemModel to the Model API

• ThermalZone::addEquipment is no longer exposed to the bind- ings to avoid confusion and problems, as you should always use ZoneHVACComponent::addToThermalZone instead (#2920, #3758)

• #3814 - Add ability to create Holiday Schedules in ScheduleRuleset

• #3882 - Add methods to edit Output:Table:SummaryReports in Open- Studio SDK

• #3875 - Add OutputDiagnostics, OutputDebuggingData and OutputJSON to model SDK

• #3853 - Fixes bug where MasslessOpaqueMaterial incorrectly had methods for setting and getting conductivity, density, and specific heat

• #3744 - New native extension gems have been added into the CLI:

**–** pycall v1.2.1 - Allows for calling Python functions from the Ruby

language **–** sqlite3 v1.3.13 - Ruby bindings for the SQLite3 embedded database **–** Oga v3.2 - Oga is an XML/HTML parser written in Ruby **–** jara\_winker v.1.5.4 - implementation of Jaro-Winkler distance algo-

rithm needed for newer versions of rubocop >= v0.80.0

• #23 - Updated extension gems have been added into the CLI:

**–** bundler v2.1.0 **–** openstudio-extension v0.2.1 **–** openstudio-workflow v2.0.0 **–** openstudio-standards v0.2.11 **–** openstudio\_measure\_tester v0.2.2

• #3796 - Reporting Measure: you can now pass model to the arguments() method of a reporting measure, for easier setup of output variables

• #3847 - Chiller:Electric:EIR node API refactor, ChillerAbsorp- tion/ChillerAbsorption tertiary node refactor

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**–** ChillerElectricEIR::designHeatRecoveryWaterFlowRate() now returns an OptionalDouble instead of a double since it can be now be autosized **–** ChillerElectricEIR no longer has getter/setters that set/return std::string for Node Names. It also wraps two new E+ fields: “Con- denser Heat Recovery Relative Capacity Fraction”, “Heat Recovery Inlet High Temperature Limit Schedule Name” and “Heat Recovery Leaving Temperature Setpoint Node Name” **–** Added missing Tertiary nodes for ChillerAbsorption **–** For ChillerAbsoprtion, ChillerAbsoprtionIndirect, ChillerElectricEIR:

∗ addToTertiaryNode overriden to only allow supply side connec-

tion. ∗ addToNode overriden to connect to tertiary loop if primary loop is already connected, and Node to connect to is on the supply side of a different plant loop than the current primary loop

• #3913 - E+ 9.3.0: Update ShadowCalculation to match object refactor in EnergyPlus

**–** ShadowCalculation::calculationMethod was renamed to

ShadowCalculation::shadingCalculationUpdateFrequencyMethod (same for setter, defaulted, and reset methods) **–** ShadowCalculation::calculationFrequency was renamed to

ShadowCalculation::shadingCalculationUpdateFrequency (same for setter, defaulted, and reset methods) **–** ShadowCalculation::polygonClippingAlgorithm() and ShadowCalculation::skyDiffuseModelingAlgorit

return type changed from OptionalString (which was always initial- ized) to std::string **–** All new fields in E+ 9.3.0 were also added

**Minor changes:**

• #3846 - SiteWaterMainsTemperature now defaults to the CorrelationFromWeatherFile Calculation Method just like in EnergyPlus.

• #3846 - BoilerHotWater “Design Water Outlet Temperature” field to match E+

• #3868 - Fix an error when querying surfaces() of ZoneHVACLowTemperature objects and surfaces have no construction

• #3844 - Fix crash in FT for HeatPumpWaterToWaterEquationFitCooling/Heating when they reference each other as companion coils

• #3871 - Remove deprecated Active Year/Institution fields in OS:ClimateZones

• #3878 - Reporting Frequencies (eg: for OutputVariable) now differentiates between RunPeriod and Annual frequencies

• #3805 - Support year in EpwFile/EpwDataPoint

• #3813 - Change default specific heat of new materials to match E+

• #3849 - Add a missing entry in ScheduleTypeRegistry for SurfacePropertyOtherSideCoefficients

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• #3855 - Autosize ZoneHVACUnitHeater Maximum Water flow rate in constructor

• #3857 - Reverse translation of WindowMaterial:Glazing sets Optical Data type field incorrectly

• #3858 - Wrong OS:Daylighting:Control rotation angle translated

• #3862 - Minor change to the E+ IDD for LifeCycleCost:UsePriceEscalation

• #3867 - Reset Surface Wind/SunExposure to NoSun/NoWind when setting Outside Boundary Condition to OtherSideCoefficients Fixed in #3916

• #3903 - Add new fields to PerformancePrecisionTradeoffs for E+ 9.3.0

• #3898 - Add Minimum zone ventilation efficiency

• #3894 - SqlFile need to support the “Year” field for IlluminanceMaps

• #3892 - Add Wrap SimulationControl’s Do HVAC Sizing Simulation for Sizing Periods

• #3885- Allow “CorrelationFromWeatherFile” for SiteWaterMainsTempera- ture’s calculation method

• #3872 - Adding advanced output variables

• #3786 #3787 - Allow SDK users to not have to write out SQLite files

• #3785 - Expose the ZoneVentilation:WindandStackOpenArea in the Model SDK

**Minor Bug Fixes**

• #3938 - Fix loading native ext gems for new gems that were added.

• #3917 - Connecting two ThermalZones in series on an AirLoopHVAC demand branch shouldn’t be allowed

• #3888 - Fix cloning issue for model objects.

• 3866 - Fix Forward translator Runtime Error if a model has a Zone- HVAC:LowTemperatureRadiant:VariableFlow but no constructions as- signed

• #3854 - Fix Maximum Hot Water Flow Rate to autosize

• #3823 - Fix RoofGeometry build errors

• #3793 - Fix ITE object supply/approach temperature difference schedule

• #3792 - Fix in support of OpenStudio Application

**OpenStudio Standards**

• correctly enable DOAS DCV

• updated and add values for the NREL ZNE Ready 2017 standard and added a ZE AEDG Multifamily standard

• updated refrigeration code to add walk-in refrigators and freezers to all relevant zones

• updated economizer logic

• add properties for climate zones 0A and 0B

• refactor methods to work with OS 3.0

• add doors to DOE prototype models

• updated multizone ventilation calculation logic in the prototype models

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• various bug fixes to prototype models and hvac system methods

**Issue Statistics Since Previous Release**

• 67 new issues were filed since the 2.9.1 release of OpenStudio (not including opened pull requests)

• 124 issues were closed since the 2.9.1 release of OpenStudio (not including closed pull requests).

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