EnergyPlus New Features Planning - FY22 Development

Each year, the EnergyPlus development team seeks input and feedback regarding new feature development for the upcoming fiscal year (FY). Features are selected based on impact, demand, effort, and available developer expertise. Input from stakeholders is a crucial component of this process, and selected stakeholders were polled for their input. The stakeholders were asked to specify up to five new features, for consideration in FY22.

The new features that were suggested were considered alongside all other requests and prioritized accordingly. Most of the requests that were rated as "high priority" or "medium priority" have been assigned to one of the three laboratories (NREL, LBNL, or ORNL) currently funded for EnergyPlus development. This does not guarantee that the feature will be implemented, since a performer will still need to be identified (from laboratory staff or a subcontractor); however, efforts will be made to implement these features in FY22.

Features considered as "low priority" will not be pursued at this time. Some requests were deemed to be out of scope for the new features task (e.g. defects, code refactoring, or performance improvements) but may be addressed as part of separately funded work.

Requester	Feature Title	Description	Agreed Priority	Assigned Lab
Big Ladder Software	Ability to simulate duct leakage and conduction without AFN		4 - High	
GARD	Enhanced handling of rainfall	This enhancement would integrate the use of weather file precipitation amounts along with two existing input objects (Site:Precipitation and RoofIrrigation) to model outside surface heat balance, rainwater harvesting, and green roof irrigation.	4 - High	LBNL
LBNL	Support GEB modeling	BTO has a new initiative GEB which will improve interactions between buildings and their serving electric grid, considering the dynamics and flexibility of energy supply, demand as well as storage. Sensing and controls are critical to enable GEB at the individual and group of buildings. This new feature request will enable EnergyPlus to support the modeling of GEB related technologies and strategies. I particular, these can be considered: (1) Speed/capacity	4 - High	LBNL

		control of VRF systems through EMS, (2) Variable speed or multi-stage chillers capacity control through EMS, (3) ATES (Aquifer thermal energy storage), (4) two-way charging/discharing of electric vehicles.		
Trane	Supporting Std. 170 min. airflow requirements for modeling hospitals.	Ability to model "All Room Air Exhaust" (ARAE) to support Std. 170. ARAE - all room air is exhausted which should override airflow balance and allows all airflow into the space (OA/RA) to be exhausted per the std. requirement.	4 - High	LBNL
ORNL WAP	New WindowMaterial:SimpleShade object	There is a need in residential modeling for a simple shade object that does a better job of representing the inputs that are typically available (shading factors instead of detailed physical properties). Current workarounds either (1) do poorly or (2) have a significant runtime impact.	4 - High	LBNL
Daikin Applied	ASHRAE 205	Please add ASHRAE 205 modeling capability to EnergyPlus. ASHRAE 205 will improve the accuracy of modeling HVAC equipment but only if the technology is available in simulation tools like EnergyPlus. Thank you!	4 - High	NREL
UIUC	Earth Tube Enhancements	Quoting from various sources: "While EnergyPlus does have an earth tube model, there are several improvements that could increase the accuracy of the predictions made by the model. The following are potential areas of improvement in the model: The existing earth tube model does not consider the time lag between the earth tube inlet and outlet air. The model assumes that the time when the outlet air comes out of the earth tube is the same as that when the inlet air enters the earth tube, despite the fact that there is a time lag in reality. The existing earth tube model does not consider the effect of the presence of the pipe on the soil temperature in the pipe vicinity. The model assumes that the soil temperature and the pipe surface temperature are uniform in the axial direction. There is also no accounting for when more than a single tube is present and how the presence of multiple tubes impacts	4 - High	NREL

		the local soil conditions. The existing model considers only the sensible heat transfer between the pipe and the soil. It does not consider the mass balance (moisture balance) between the pipe and the soil. Item 2 above is critically important. In climates with cold winters and moderate summers, we use earth tubes to preheat ventilation air all winter, which works very well (earth tubes followed by ERVs nearly eliminate all heating of ventilation air). This approach also creates a store of coolth in the ground, by cooling the soil surrounding the earth tubes. If we are judicious in the use of earth tube air (E.g., bypass the earth tubes in the spring/early summer), the stored coolth is adequate to cool ventilation air very effectively. Currently, this effect is not captured at all in the earth tube object. There is zero sensitivity in summer results as to whether or not cold air passed through the earth tubes all winter. We would use this object far more if it captured these effects."		
NREL-R	Tankless Water Heater Model	The current approach for modeling a residential tankless water heater in EnergyPlus is to model a small volume tank with a very large burner and a constant efficiency. This efficiency is the burner efficiency, but also includes a derate to account for losses due to cycling of the water heater when the heat exchanger comes up to temperature and then cools. This derate is dependent on the actual draw profile the user inputs, but often an average value derived from field data is used (see Building America, RESNET, California). A more explicit lumped capacitance model has been developed that could directly account for the cycling losses without requiring a derate. GTI has been doing lab testing of tankless water heaters and has derived the necessary model parameters for a few different units that could be used directly in this new model to ensure realistic performance.	4 - High	NREL

GARD	Extend Spaces to Sizing and HVAC	Spaces (which are <= Zone) (will soon) allow specification of surfaces and internal gains by Space for the zone heat balance and reporting. Sizing and HVAC are still done at the Zone level. Extending Spaces to do sizing calculations and HVAC simulation by Space would enable room-by-room HVAC sizing and modeling of individual room temperatures within a larger HVAC zone.	4 - High	NREL
OSU	Autosizing of ground heat exchangers	Ground heat exchangers in EnergyPlus cannot currently be autosized. This feature would add the capability to autosize standard configurations with regular spacing (e.g. rectangles, open-rectangles, U-shapes, L-shapes, lines) by either adding/subtracting boreholes, or by increasing/decreasing the borehole depth.	4 - High	NREL
Foresight Management	Autosizing for high latent loads	When the internal latent load is high or dominant, E+ fails to autosize HVAC. An example is indoor growing facilities. Enhancing autosize to accommodate this situation will be a huge assist for modelers working on those facility types.	4 - High	NREL
Big Ladder Software / DesignBuilder	Generate ground temperature / heat flux output for Kiva instances		4 - High	NREL
Carrier	Multi-speed Fan for VRF Indoor Terminal Units	Many of the VRF indoor terminal unit come with multi-speed fan control to save fan energy and reduce noise. To simulate these VRF terminal units accurately, we propose to add supply air flow ratio input fields for multiple speed fan to the object ZoneHVAC:TerminalUnit:VariableRefrigerantFlow. In simulation calculation, for each time step, cycle the terminal fan between two speeds based on the capacity at each air flow ratio and the required load output.	4 - High	NREL
PNNL	Integrate zonal equipment node with the Airflownetwork, may trigger the needs to	Currently, a bypass was created to handle zonal equipment by allowing them to not connect to the AFN, when AFN presents. This enables the simulation to finish, but it was a temperary solution, and potentially create errors in simulation result due to not	4 - High	NREL

	allow multiple HVAC systems for AirflowNetwork	checking the air nodes connection integrity, and was not able to capture the pressure/flow impact from those zonal equipments.		
ORNL WAP	AirflowNetwork Duct Autosizing	Duct sizing is one of the remaining barriers to greater usage of the AFN distribution feature. For simpler and smaller models, inclusion of the pressure network may require more inputs and information than the base energy model itself. Removing duct size inputs will be especially helpful in schema-driven modeling efforts (e.g. the approach used in several audit-related interfaces) that may need a legitimate distribution system but lack detailed inputs to construct one. Adding this feature would greatly simplify the required inputs to create a fully featured residential AFN model with distribution.	4 - High	NREL
LBNL	Multiple ground surfaces	Currently EnergyPlus only allows one single ground surface with user defined ground solar reflectance and ground temperature. Each exterior surface has a single view factor to ground. A real building usually sees multiple types of ground surfaces, e.g., bare soil, grass, sidewalks, driveways, water surface, which have different solar reflectance and temperature.	4 - High	NREL
NREL-R	Generic tags/properties for all objects	Allow user-defined key/value properties (tags) to be attached to all EnergyPlus objects, similar to OpenStudio's AdditionalProperties object. The OpenStudio object is described as follows: “OpenStudio now includes the generic AdditionalProperties object that can be used to apply user-defined properties to objects in the OSM. These properties do not directly change the model in any way nor are they forward-translated to EnergyPlus. Rather they can be used by measures to apply logic.” This would allow EnergyPlus consumers to attach additional information to their model and use it in business logic. It would also allow the OpenStudio additional properties to pass through to the EnergyPlus model. Ideally the tags/properties would be written to the EnergyPlus output (e.g., SQLite database) so	4 - High	NREL

		that it can be used as part of output querying.		
GARD	Convert HVACDiagram to python	The HVACDiagram tool that is packaged with EnergyPlus is limited in several ways and is written in Fortran. A new Python-based tool for generating HVAC topology diagrams and graphs is desired.	4 - High	ORNL
GARD	Add units conversion and other options for time series output directly from EnergyPlus (replace RVI input).	Currently, RVI/MVI files are used to control the order of columns for csv time series output produced byt the ReadvarsESO post-processor, and units conversion are done by the convertESOMTR post-processor. EnergyPlus can write time series output directly now (in csv or other formats), but there are no options to control units and ordering.	4 - High	ORNL
Bractlet	Return air temperature reset setpoint manager	We often see buildings using a return air temperature (RAT) reset to adjust supply air temperature (SAT) setpoints on their AHUs. There are two common versions of this: 1) Linear relationship between RAT and SAT setpoints 2) Range adjustment to SAT setpoint to achieve specific RAT setpoint Version 1 would essentially be a modification of SetpointManager:OutdoorAirReset, but with the ability to point towards the return air temperature in an airloop instead of the outdoor air temperature. Version 2 would be a modification to SetpointManager:ReturnTemperature:ChilledWater, but with the ability to use on an airloop instead of a plantloop. Currently we accomplish these resets using EMS, but they can get very cumbersome in large buildings with many AHUs. Having a built-in solution would save us a lot of time.	4 - High	PNNL
PNNL	Rating conditions for autosizing water-to-air	Use user-specified rated conditions to calculate rated capacity and COP of water-to-air coils. When using EnergyPlus and when autosizing	4 - High	PNNL

	cooling and heating coils	the gross rated capacity of water-to-air heating and cooling coils, the capacity is calculated based on the load at peak design conditions and is normalized at 85 deg. F entering water temperature (EWT) and peak design conditions for EA WB. The issue with that approach is that the rated conditions vary significantly with the type of equipment that's actually being modeled, and none of them use the conditions that EnergyPlus currently uses. It is assumed that the user input COP is at rated conditions, however, this is not the case for this object because of the aforementioned approach used by EnergyPlus. Hence user-input COP should be input at the rated condition assumed by EnergyPlus to model the correct COP at rated conditions. The current approach is confusing and error-prone. We propose adding rating conditions inputs to water-to-air heating and cooling coil objects so the user can explicitly model a COP at rated conditions		
PNNL	Support of variable volume fans in PIU air terminals	Add capabilities in EnergyPlus to model variable speed fans when using PIU units.	4 - High	PNNL
LBNL	Resilience metrics	Add calculation and reporting of Hours of Safety which is a building thermal resilience metric developed and promoted by EPA and RMI. Also to improve current resilience metrics reporint by allowing users to specify the period of calculating and reporting the metrics which is not necessarily the same as the simulation period.	3 - Medium	LBNL
LBNL	Thermochromic coating	Studies have shown thermochrometric coating can dynamically adjust opaque surface temperature to provide passive cooling or heating. EnergyPlus need to support modeling of this technology. Note that thermoshrometric windows are already in EnergyPlus.	3 - Medium	LBNL
NREL-R	Heat Pump Defrost Cycle Supplemental Coil Operation	Residential, forced-air heat pumps often run back-up heating systems during defrost cycles and for several minutes following the defrost cycle to mitigate comfort issues. For example, *all-electric* heat pumps turn on electric resistance back-up heating elements	3 - Medium	NREL

		whereas *dual fuel* heat pumps turn on the gas furnace during defrost operation. This has a significant impact on overall heat pump performance and should be accounted for in the EnergyPlus models. Given the increasing importance and adoption of heat pump technologies, it is important to accurately model this energy consumption.		
NREL-R	Schedule:File option to ignore Daylight Savings Time	When a Schedule:File is used and daylight savings is turned on for a simulation, daylight savings is applied to the schedule file values by removing an hour in the spring and duplicating an hour in the fall. This behavior is not documented although there is a warning issued. We propose adding a field to the Schedule:File object to toggle this behavior or to just apply the schedule file to every hour of the year using standard time as specified in the schedule. We propose making the default behavior of the Schedule:File the new behavior, but in version translation to set the value to maintain the old behavior. Also, the toggle and the application of the schedule with DST will be documented, which it is currently not.	3 - Medium	NREL
Cornell U	Compact format for entering 8760h schedules in the IDF	Daylight models often use flat 8760 arrays for schedules. It would be nice to have a way to enter these as flat arrays in the IDF file without the need of a separate CSV file.	3 - Medium	NREL
GARD	Output Std 90.1-2019 equipment efficiency metrics.	ASHRAE Std 90.1-2019 included many updates to the mechanical equipment efficiency tables. New metrics are used in the tables to describe the efficiency of equipment. Current output reports that report metrics for mechanical equipment should be updated to also report the new metrics.	3 - Medium	NREL
University of Colorado	Support modeling of complex exterior shading systems and controls: Dynamic Shading Devices and	Currently EnergyPlus cannot be models several configurations and controls for external shading systems. For instance, no option in the current 'Shading Control' dropdown of 'WindowProperty:ShadingControl' object cannnot control the shades based on transmitted direct solar energy. At present, all available options are for incident direct + diffuse solar radiation. Moreover, EnergyPlus	3 - Medium	NREL

	Additional Controls for Shading Devices	cannot model directly adaptive and dynamic external shading devices. Indeed, EnergyPlus does not allow controls of shading devices due to the complexity of adjusting the geometry. This new feature request will enable EnergyPlus to support shading systems that can take several positions depending on user defined (or optimized) control strategies. The new feature can allow the integration of PV panels as part of static/dynamic shading devices.		
University of Colorado	Add Options to Control Low Temperature Radiant Systems Based on Thermal Comfort Models	The current EnergyPlus models for radiant systems (radiant floors and walls) allow only the indoor temperatures to be maintained as no control strategies are available to operate the systems based on other thermal comfort indicators such as PMV levels or main radiant temperatures. However, forced air systems (such as packaged single zone or variable air volume) can be modeled in EnergyPlus using control strategies involving different thermal comfort indicators. Thus, it is difficult if not possible to compare the performance of radiant floors to forced air systems when both are controlled using thermal comfort indicators other than air temperatures. A wide range of studies including those conducted by the project team members have shown that significant energy savings can be achieved by operating radiant slabs using other indicators more representative of indoor thermal comfort than air temperatures.	3 - Medium	NREL
Foresight Management, ABUD	Possibilties to connect Humidifier:Steam/Gas with central heating plant	Usually we come across projects such as industries/museum with strict indoor RH requirements. In general the design has a dedicated system (plant loops, pumps etc.) serving humidifier which can't be modeled in the current version of E+. Though there are simple objects Humidifier:SteamGas which allows some conservative approach to model such cases	3 - Medium	NREL
Trane	Ability to model Air Cooled Chiller with Heat Recovery option.	Currently there is no ability to model partial/full heat recovery for air-cooled chillers.	3 - Medium	NREL

PNNL	Two-stage economizer	Currently, unitary systems with multispeed fan only operate economizer at low speed but recent energy codes requires some system to have two stages of economizer. Example: Section 6.5.3.2.1.c in 90.1-2019 states “Units that include an air economizer to meet the requirements of Section 6.5.1 shall have a minimum of two speeds of fan control during economizer operation”. We proposed that the multistage economizer be used before using mechanical cooling	3 - Medium	NREL
ORNL WAP	Small Model Optimizations	Smaller models (e.g. residential models) may not need the full complexity of EnergyPlus, and there are options and settings that can improve performance. A single location (like PerformancePrecisionTradeoffs) to enable these options would greatly simplify the access and use of those options and provide a collection location to collect future enhancements that improve performance.	3 - Medium	ORNL
UIUC, CBE	Direct Solar on Furniture	“Ability to model direct solar on furniture (e.g. internal mass) in some capacity, as this has a relatively large effect on zone cooling and heating load. See paper here where we tested this out in EnergyPlus by modifying which surfaces participate in the direct solar exchange. A more practical way to do this - without requiring users to explicitly define a geometry for the internal mass surface - is to assign a user-defined fraction of direct/diffuse solar to the internal mass surface, similar to how the internal mass surface currently participates in long wave radiant exchange. e.g. X% of the direct solar incident on the floor is instead incident on a defined internal mass surface. It could also just be chooses not to input anything.” This can be proposed as a potential new feature and it will be added in GitHub as a potential idea for future work. As CBE has shown, this can potentially have a significant impact as it effectively shifts some of the solar load from a radiant heat addition on particular surfaces to something that will likely convect heat to the space fairly rapidly.	3 - Medium	z - Not Assigned

University of Colorado	Add capability to model Ice and Snow Melting on Building Exteriors	Some high-end buildings use pipes embedded in sidewalks and parking lots to provide a safer, ice-free area around a building. While EnergyPlus has much of the weather information needed to potentially model these systems, EnergyPlus is currently not capable to estimate the energy consumption of snow/ice melting systems.	3 - Medium	z - Not Assigned
Building and Systems Analytics	outside air infiltration	recent work has shown outside air infiltration and exfiltration can be influenced by stack effect (especially in tall, Supertall and Mega Tall buildings). The infiltarion and exfiltration in a building is dependent upon therelationship of shafts which run the height of a building such as emergency stairs and freight elevators.	2 - Low	z - Not Assigned
Building and Systems Analytics	Solar tracking and space thermal comfort	Development of a Unified Tool for Analysis of Room Loads and Conditions ASHRAE 1766-RP The RPEHBX module uses SketchUp to draw the spaces being considered. The legacy module links the Sketchup into OpenStudio. When OpenStudio is run it produces an *.idf file which are loaded into the RPEHBX module for further analysis. ASHRAE Research Project 1383-RP, Develop a Radiant System Module for the Simulation and Analysis of Spaces and Systems, produced analysis procedures that allow calculation and display of comfort conditions at any point within a room. These procedures are implemented in a PC-based application called Radiant Performance Explorer (RPEHB), an enhanced version of the ASHRAE Comfort Tool. The project developed a method for calculating view factors from an arbitrarily-positioned occupant to all surfaces of an arbitrarily-shaped space. With this general ability and knowledge of room surface temperatures, mean radiant temperature (MRT) can be calculated for any occupant position. This in turn allows derivation of common comfort measures, such as PMV and PPD. Other radiant values, such as radiant temperature asymmetry, are also calculated. RPEHB displays these results in a computer-graphics based visualization screen.	2 - Low	z - Not Assigned

		This research integrates software previously developed by several ASHRAE research projects to create a single tool that includes the necessary algorithms to complete the tasks of calculating heat balance and radiant energy exchange in a space. This application is provisionally named RPEHB and will be created by combining RPE (from 1383-RP) and the heat balance room model (originating in 987-RP and enhanced by 1199-RP and 1311-RP). Traditional energy models provide only solutions for convection loads in spaces. With the emergence of radiant systems for heating and cooling there is a demand for a radiant design tool that can successfully simulate radiant systems and radiant energy exchange in a space. This is particularly important for predicting the performance of spaces that incorporate radiant components, but is equally important to evaluating any space's passive performance during intermediate seasons. Nor can we disregard the need for knowing the surface temperatures of spaces using conventional air systems – especially those that utilize considerable areas of glass and exterior wall. For many spaces using conventional air systems, the tools for predicting energy performance have been considered adequate. To properly assess the radiant exchange in a space the dynamic interactions of a space involving conduction, mass storage, radiant exchange between surfaces and convection heat transfer must be predicted. Also required is the ability to predict the dynamics performance of systems. Both passive and active performance where the resulting radiant indices are required. RPEHB is delivered as a "bookstore ready" product, suitable for use by researchers and practitioners. RPEHB can import and display data generated by the 3D drawing tool SketchUp, the building energy simulation application EnergyPlus, or other sources. Export of comfort results is available.		

		The project also enhanced EnergyPlus to more flexibly model controlled-temperature panels. Accompanying this report is the 1766-RP source code CD that contains all computer code and other files needed for use and subsequent development of the software.		
UIUC, CBE	Better Model for Low Temperature Radiant Panels	"While we have not attempted to validate the performance of metal radiant panels with the existing LowTempRadiant models, we anticipate that the response will not accurately represent realistic performance. In a real metal panel, thermal resistance between water and the room is dominated by 2-d or 3-d heat transfer, so it cannot reasonably be simplified to a surface with 1-d heat transfer. We recommend developing a new object class ZoneHVAC:LowTempRadiant:LowMassPanel, with input fields that align with the standard rating test defined by EN 14240." The existing low temperature models in EnergyPlus are designed to model more thermally massive systems that are embedded in concrete. Metal panels are significantly different in their dynamics and response than these models allow. There is a "simple cooling panel" model in EnergyPlus called: "ZoneHVAC:CoolingPanel:RadiantConvective: Water". This model is not "attached" to any particular surface but does allow the user to specify radiant fractions to individual surfaces and has design rating information similar to the radiant/convective models in EnergyPlus. It seems probable that this "simplified" model is not sufficient to adequately model situations like metal panels. The simplified model was a stop-gap effort to provide something but was never intended to be a full featured model. A new model is needed that integrates with the existing EnergyPlus heat balances and models the layout and dynamics of this systems correctly. In other words, this requires a new model.	2 - Low	z - Not Assigned

UIUC, CBE	Improved Autosizing for Radiant Systems	"Modify autosizing procedures to take into account radiant heat transfer and thermal mass of radiant system and zone. Also, modify autosizing procedures to take into account that the initial temperature of the radiant slab may be high for cooling or low for heating during the annual simulation. In the design day procedure, repeated days are used to size the system and the initial slab temperatures are consistent between the repeated days which may be at mild initial temperatures but depending on the type of control the difference between initial conditions used in the design day may be very different to what is experienced in the annual simulation. For example when using a 24-hour lockout between cooling/heating mode switching, the radiant slab may store more heat before the cooling lockout is removed. The design day size parameters may no longer be sufficient to remove the extra heat stored in the slab." In discussing this with CBE during an internet-based meeting, this issue might be resolved somewhat by using a "Design Week" versus a "Design Day". Back before EnergyPlus, BLAST had the capability to run a design week which was essentially seven identical weather days in a row. The purpose of this was to model thermal energy storage and allow it to use the weekend period to fully charge the system and then slowly deplete the storage over the weekdays. While the purpose here might be different, the addition of a design week in EnergyPlus could be beneficial for thermal energy storage as well as radiant systems. This would probably need to be looked at in more detail with regards to whether or not the weather over the entire week was identical like in BLAST or whether the user should be allowed to make some sort of changes. Another potential idea is to create an auxiliary program to generate a design week of weather data and perhaps create something in the input to flag that this weather file is for "design" or "autosizing" purposes. There may be other good ideas	2 - Low	z - Not Assigned

		that the development team or others have to add here as well. Depending on how this is approached, this could potentially be a fairly significant amount of work.		
NREL-CUS	Integrating CAMBIUM emissions data into EnergyPlus/OpenStudio Analysis	Now that we have future projections of emissions due to electricity use (CAMBIUM), we can apply that to building operational energy use. I imagine being able to choose from different emissions scenarios, and EnergyPlus automatically understanding how to apply the local information and output building emissions over time (perhaps in graphical form).	2 - Low	z - Not Assigned
NREL-R	User-Specified View Factors w/ Defaulting	The current approach to specify user-defined view factors is to enumerate all view factors with the ZoneProperty:UserViewFactors:BySurfaceName object. This can be non-trivial to apply considering 1) the exponential relationship between number of view factor pairs and number of surfaces in the zone and 2) the complexity of calculating view factors outside EnergyPlus. It can also introduce negative runtime performance impacts. There is a need to be able to specify/override some view factors (e.g., enter zero view factors between specific pairs of surfaces which don't see each other) while allowing EnergyPlus to default the remaining view factors. While there is ongoing work to allow better View3D integration, this does not help many residential models where full 3D geometry is not available. A simplified input method should be developed to allow users to only specify those pairs of view factors they want to modify, leaving others to be automatically calculated by EnergyPlus following the same procedure it adopts to approximate direct view factors. The proposed new feature can either be a new field in the existing ZoneProperty:UserViewFactors:BySurfaceName object to switch from complete user-defined view factors or partially defined view factors, or a new similar object to allow partially defined view factors.	2 - Low	z - Not Assigned

Cornell U	Fan and pump energy for Ideal Air Loads HVAC system	Ideal Air System is great for teaching Architects about energy modeling, but it misses fan and pump energy outputs/modeling capability.	2 - Low	z - Not Assigned
Cornell U	Simple HVAC Systems (similar to Ideal Air Loads in complexity)	It would be great to provide modelers with simple means to simulate high-level system performance at the early conceptual design stage. Modelers would like to compare different system options quickly. The Ideal Air Loads system in EnergyPlus has the right amount of complexity and can already model several things well, but it cannot be used to compare different system types easily. It would be great if EnergyPlus could be expanded with templates or new simple HVAC objects that would allow modelers to quickly build simple, high-level models of common heating, cooling, and ventilation systems (furnace + chiller, heat pump (air, water) as well as different distribution approaches (air, hydronic, VRF).	2 - Low	z - Not Assigned
Bractlet	Steam to Hot Water Heat Exchanger	This is a continuation from a FY21 request. We often see buildings, especially in NYC, with district steam systems feeding their hot water loops via heat exchangers. Updating the HeatExchanger:FluidToFluid object to handle steam on the demand side would allow us pick up that behavior.	2 - Low	z - Not Assigned
University of Colorado	Add Thermostatic Control of Ventilated Slabs	The current EnergyPlus model for ventilated slab systems is based on several assumptions that limit some of its capabilities. In particular, the current model requires that the users provide a schedule for the air inlet temperature flowing inside the slab. This specification does not allow EnergyPlus to control directly the indoor space temperature but only indirectly through adjustments of the airflow rate and temperature schedules. This process can be time consuming especially considering the time lag associated with the slab thermal mass.	2 - Low	z - Not Assigned
University of Colorado	Support modeling of GEB (Grid interactive efficient buildings)	Currently EnergyPlus cannot be directly used to model several GEB technologies including switchable insulation systems for walls and roofs. Indeed, EnergyPlus assumes that CTFs for walls and roofs are static and do not change with time depending on a set of	2 - Low	z - Not Assigned

	technology: Switchable Insulation Systems	controls and sensors. This new feature request will enable EnergyPlus to support the modeling of GEB related technologies and strategies.		
OSU	Further increase speed of ground heat exchanger response function calculation.	In FY 2021, the capability to calculate ground heat exchanger response functions was added. The use of BLAS/LAPACK had to be replaced with the Eigen C++ library to ensure cross-platform compatibility which resulted in a performance regression from previous versions of the original code library. Since then, additional measures to improve the speed have been discovered. This feature would implement these measures and improve the speed of these calculations.	2 - Low	z - Not Assigned
Foresight Management	Account forZoneHVAC:Dehumidifier:DX heat rejection within the timestep.	In recent troubleshooting effort for a model that uses this object, we learned from Richard Raustad that the additional heat rejected to the zone is "stored" for the next timestep. This creates significant instability in the zone temperature control and forced us to abandon use of the object in favor of a workaround. We recommend re-working the object so the timestep heat balance accounts for the comrpessor heat of rejection within the same timestep.	2 - Low	z - Not Assigned
Big Ladder Software	Radiant surfaces in Kiva		2 - Low	z - Not Assigned
Carrier	Model Radiant Panel that only covers part of a Surface	A new technology was developed by industry. This is currently not supported by EnergyPlus. Please add support for it. It is used by 10000 people around the world and cannot be simulated in EnergyPlus.	2 - Low	z - Not Assigned
Trane	Ability to model refrigerant migration in chillers for free cooling.	Currently there is no ability to model refrigerant-migration free cooling in chillers	2 - Low	z - Not Assigned
Trane	Ability to override U-factor at the construction level for	Most of the time users have manufacturing data at the building construction but not for specific individual material layers. Ability to override at the construction would be useful to match 90.1 std.	2 - Low	z - Not Assigned

	opaque materials.			
PNNL	Condenser flow control	Currently, condenser plant flow control appears to be controlled based on the number of active chiller. We propose that new controls be added so flow can be set based on the size of active chillers.	2 - Low	z - Not Assigned
ORNL WAP	Report heating/cooling loads for models w/ HVAC systems	For residential simulations, the heating and cooling loads are often needed (sometimes these values are required), and at present there is no way to get this exact value without running a separate simulation (using ideal systems). The Zone Predicted Sensible Load output variables provide approximate answers, but for situations that require the loads approximate answers are insufficient. Direct reporting of the heating and cooling load out of a single simulation would address this issue.	2 - Low	z - Not Assigned
ORNL-BTO	Version Downgrade Option	Feature to downgrade model from newer version to older versions. This can be useful for version compatibility when EnergyPlus is used with other software. For example when a new IDF has made a significant modification and might have to downgraded to be used with other program like EnergyPlus to FMU converter	2 - Low	z - Not Assigned
ORNL-BTO	Unused input values delete function	It does not affect running the EnergyPlus simulation program. But, if the unused input values delete function is available, then it would be easy to find the simulation error and save time.	2 - Low	z - Not Assigned
LBNL	Improving infiltration/exfiltration model for tall buildings	Tall/supertall/megatall buildings have unique characteristics and energy use. Infiltration/exfiltration significantly influences indoor air quality and energy use in tall buildings due to significant differences in indoor and outdoor temperature as well as air pressure. Currently, EnergyPlus does not calculate exfiltration (not air flow network) which is common in tall buildings.	1 - Group with Other Item	

Carrier	Add features to support use of ASHRAE Standard 205 equipment data representations in energy simulations	Add algorithms to perform equipment performance calculations using source data in ASHRAE Standard 205 formats.	1 - Group with Other Item	
DesignBuilder	Improvements to Kiva outputs	DesignBuilder users have reported that they would like to know more about what is happening within the 2-D ground domain. It would help users to build confidence in Kiva in general to be able to compare design options if EnergyPlus supported a mechanism to export this data to a file. This would allow them to generate plots of ground temperatures (and possibly heat fluxes) similar to the "Output Snapshots" available in the standalone Kiva program. Ideally there should also be a way to allow Outside face temperatures to be generated for Kiva surfaces for a quick indication of ground domain temperatures at some key domain boundaries	1 - Group with Other Item	
DesignBuilder	Improve earthtube modelling using Kiva	The current earthtube option requires pre-processing in an external tool which is limiting uptake of this feature in EnergyPlus, and so potentially of the earthtube technology itself. The current earthtube calculations should be updated to allow the ground domain temperature field to be calculated directly in EnergyPlus, possibly using the Kiva engine.	1 - Group with Other Item	
DesignBuilder	Allow coupling of Kiva with radiant surface systems	The recently added Kiva ground heat transfer model can be used to perform detailed ground heat transfer from basements and slab-on-grade floors. Currently there is no method in EnergyPlus for estimating the heat loss to ground from slab-on-grade radiant floors. In this proposed task the ground heat transfer model Kiva would be linked to the low temperature zonal radiant floor model. Research has shown that heat loss from slab-on-grade radiant floors can be significant and should be accounted for when modelling these types of systems.	1 - Group with Other Item	

Big Ladder Software / Integral Group	Kiva based Earth Tube Model	EnergyPlus has an earth tube object, however there is limited capability to accurately model the ground temperatures, which in turn severely limits the accuracy of the results. Specifically, the ground temperatures are for undisturbed ground and do not account for the fact that the air passing through the earth tubes affects the temperature of the soil surrounding the earth tubes. The effect of this seasonal storage cannot be overstated – when earth tubes are used in cold climates, they provide a preheat of ventilation air during the winter. In the summer, the soil surrounding the earth tubes has been significantly cooled, and is a store of coolth, being able to meet all air conditioning needs in many projects/climates. However, the current earth tube object shows zero sensitivity in summer results as to whether or not cold air passed through the earth tubes all winter. The earth tube object was implemented prior to KIVA ground modeling and prior to Conduction Finite Difference (CondFD) being implement in EnergyPlus. If they could be updated to use KIVA and CondFD for accurate ground temperatures, the utility to practitioners would be significantly increased. Currently, there is no software we are aware of which calculates this effect for an 8760 model. Additionally, the earth tube object currently does not integrate with HVAC systems but rather delivers the outdoor air to a single zone. This should be updated so the way earth tubes are actually used can be modeled. By being able to connect to the outdoor air node of a HVAC system, it would enable users to model the way earth tubes are used as a pretreatment of outdoor air, as opposed to the only treatment.	1 - Group with Other Item	
Big Ladder Software / Argonne National Laboratory	Support for ASHRAE 205 equipment representations	DOE financially supports the development of ASHRAE Standard 205. The standard is now nearing publication, and to date there are no software implementations available. EnergyPlus should be one of the first adopters of the standard.	1 - Group with Other Item	

ORNL-BTO	Unit Conversions for Native CSV	The "OutputControl:Files" is incredibly useful but there is no capability to convert units (post-processing required). The current unit conversion mechanism involves the "convertESOMTR" and "convert.txt" which is not used with output file control.	1 - Group with Other Item	
ORNL-BTO	GUI/Diagram for Branch and Node diagram	Diagram to display HVAC system connection and configuration could be integrated into Energyplus. Currently we can only look at the air loop diagram without any nodes. If we could also output diagram for HVAC configuration with HVAC components and nodes that would be useful and more intuitive than the text file for Branch and Node diagram.	1 - Group with Other Item	
ORNL-BTO	Hourly output template	Currently, the hourly (or subhourly) report should be defined by users to be generated. At least, some high level hourly report (e.g., energy end use & zone temp hourly repor)t can be generated as default when users select the option.	1 - Group with Other Item	