L•PRIZE®

U.S. Department of Energy

Manufacturing and Installation Phase Technical Performance and Scoring Form

Connected Systems Track

This form is to be used by the competitor to report key performance metrics or capabilities of their connected system and the associated points they expect would be earned for these performances or capabilities. This form is in addition to the technical documentation that must be submitted as described in Appendix B of the Official Rules for each requirement. A summarized checklist of these technical documentation requirements is provided in Appendix D of the Official Rules. The L-Prize Expert Reviewer Panel will use this Technical Performance and Scoring Form in combination with submitted documentation and physical evaluation (where applicable) to determine the total number of points earned for a submission.

Instructions

1. Review Section IV.4 of the L-Prize Official Rules to understand how this form will be used about how the total score for a submission will be determined.
2. Report the performance or capability and associated number of points earned for each requirement in this form, based on Appendix B of the Official Rules.
3. Provide any additional notes you would like the Expert Reviewer Panel to know about the performance, capability, or points earned.
4. Forms must be completed digitally; handwritten forms will not be accepted.
5. Save the file as a PDF and submit as part of your Manufacturing and Installation (M&I) Phase submission at https://www.herox.com/LPrize.

Technical Interoperability	The capability to physically connect two or more devices or systems
Minimum Requirement(s) The lighting system must include network interfaces incorporated into system devices to enable exchange of data with other system devices. The interfaces must comply with at least one existing industry standard specification for basic physical network connectivity, such as: IEEE 802.3 (Ethernet), IEEE 802.11 (Wi-Fi), IEEE 802.15.4 (ZigBee, 6LoWPAN), Bluetooth Mesh, etc.	**Possible Points** n/a
What industry standard specification(s) for basic physical network connectivity does the system comply with?	
Points are not applicable for this requirement.	n/a
Provide any additional notes you would like the Expert Reviewer Panel to know about the technical interoperability.	

Application Interoperability	The capability to exchange actionable information between two or more devices or systems
Minimum Requirement(s) The lighting system must provide an application programming interface (API) for application-level interoperability. At a minimum, the API shall provide access to: 1) individual luminaire occupancy data, 2) individual luminaire energy use data, 3) lighting zone characteristics: luminaires within the zone, control strategies, room name, space type, and any other related metadata, 4) individual zone occupancy data, 5) individual zone energy use data, and 6) automated fault detection and diagnostics (FDD) data. FDD and energy reporting data must align and comply with the separate FDD and Energy Reporting requirements contained in the L-Prize rules document.	**Possible Points** Ten points (+10) will be awarded to lighting systems that have a BACnet interface that is certified by BACnet Testing Laboratories and is capable of sharing data with building management and HVAC systems. The interface shall enable the lighting system to share the following data 1) lighting zone cumulative energy use, and 2) lighting zone occupancy status. A BACnet Objects Table shall be provided for each data type. See Supplemental Testing Guidance in the Official L-Prize Rules for more information. An additional five points (+5) will be awarded to lighting systems that are capable of calculating a customized HVAC zone occupancy and sharing HVAC zone occupancy status with HVAC systems via the same BACnet interface. A BACnet Objects

A single Postman collection file and a single Postman environment file with all the variables and endpoints that can be expected to be used during testing shall be submitted. All API calls shall rely only on RESTful methods and not require invoking any other protocol (e.g., WebSockets, Cap'n Proto, etc.) to retrieve the data. API developer documentation and an OpenAPI specification (OAS) document encoded in JSON shall be submitted. The submitted documentation shall include, at a minimum: authentication guidance; API resources guidance including all endpoints, error codes, and debugging guidance; an up-to-date changelog; and terms of use.	Table shall be provided for the HVAC zone occupancy data type. See Supplemental Testing Guidance in the Official L-Prize Rules for more information.
Does the lighting system have a BACnet interface that is certified by BACnet Testing Laboratories and is capable of sharing data with building management and HVAC systems?	
Is the lighting system capable of calculating a customized HVAC zone occupancy and sharing HVAC zone occupancy status with HVAC systems via the same BACnet interface?	
How many application interoperability points are earned based on this capability? (Enter 0, 10, or 15)	
Provide any additional notes you would like the Expert Reviewer Panel to know about the application interoperability or points earned.	

Cybersecurity	The capability to protect networks, devices, and data from unauthorized access or malicious use
Minimum Requirement(s) The system must be certified by a third-party certification body for cybersecurity performance, using the same approach and allowed cybersecurity certifications as the DesignLights Consortium (DLC) Technical Requirements for Networked Lighting Controls, Version 5.0 or newer. Acceptable certifications and services include SOC 2, ISO/IEC 27001, ISO/IEC 27017, FedRAMP, CSA STAR, PSA Certified, ANSI/UL 2900-1, ANSI/ISA/IEC 62443, ioXt, UL IoT Security Rating (UL 1376), CSA Cybersecurity Verification Program (CVP) (CSA T200), and Intertek Cyber Assured.	**Possible Points** n/a
What certifications or services for cybersecurity performance does the system comply with?	
Points are not applicable for this requirement.	n/a
Provide any additional notes you would like the Expert Reviewer Panel to know about the cybersecurity performance.	

System Resilience	The capability of the connected system to continue to function in the event of loss of connection to power, data network, and/or system controllers
Minimum Requirement(s) With a loss of connection to the internet, all lighting control strategies (task tuning, scheduling, occupancy sensing, daylight harvesting, and manual control) must continue to be implemented by luminaires and associated control devices in their pre-programmed state prior to loss of connection. With loss of connection to electrical power of up to 48 hours, and upon power reconnection, all lighting control strategies must continue to be implemented by luminaires according to their configuration prior to loss of connection.	**Possible Points** Fifteen points (+15) will be awarded to systems that maintain control strategy implementation with loss of connection to the next higher networked element in the system's topology, such as a gateway.

For which loss of connection(s) is the system able to continue to implement lighting control strategies? (Enter: loss of connection to internet, loss of power for 48 hours, and/or loss of connection to gateway/next higher network element)	
How many system resilience points are earned for this capability? (Enter 0 or 15)	
Provide any additional notes you would like the Expert Reviewer Panel to know about the system resilience capability or points earned.	

Fault Detection and Diagnostics	**The capability of the connected system to identify and diagnose faults and deliver notifications to operators about those faults**
Minimum Requirement(s) The lighting system must have the capability to identify and report faults in the system including but not limited to device/equipment errors and loss of network communication. Methods must be provided for automatic notification of faults to building operators. Notification must occur within 60 minutes of the fault.	**Possible Points** Eight points (+8) will be awarded for systems that leverage the data provided by D4i drivers to detect and report specific faults including, at a minimum, LED array/module failure, LED driver failure, compromised performance (e.g., reduced light level, and/or strobing light output) resulting from electrical power faults (over/under voltage and/or current), and electrical service interruption. The methods to detect and report these faults must be described. Seven additional points (+7) will be awarded for systems that can report remaining life for LED modules/boards and LED drivers, detect and diagnose the cause of LED array/module and LED driver failures (e.g., normal wear-out; accelerated wear-out due to high temperature, electric power faults), and predict potential faults so as to facilitate group or preventative maintenance.
Is the system able to detect and report specific faults including LED array/module failure, LED driver failure, compromised performance resulting from electrical power faults, and electrical service interruption? (Enter Yes or No)	

Is the system able to report the remaining life of LED modules/boards and drivers, detect and diagnose causes of LED array/module and driver failures, and predict potential faults? (Enter Yes or No)	
How many fault detection and diagnostics points are earned for these capabilities? (Enter 0, 8, or 15)	
Provide any additional notes you would like the Expert Reviewer Panel to know about the fault detection and diagnostics capabilities or points earned.	

Standards-Based Luminaire Level Lighting Control (LLLC)	**A connected sensing/communication module with occupancy and ambient light sensing capabilities that can be directly installed into each luminaire through a standards-based Zhaga Book 20 or NEMA LS 20000-2021 sensor receptacle (shapes RR1, RR2, CC1, CC3, ORC5, or EM1) and connected to a standards-based D4i-certified driver**
Minimum Requirement(s) The connected system must provide a sensing/communication module that can be physically installed into a luminaire through a Zhaga Book 20 compliant sensor receptacle or a NEMA LS 20000- 2021-compliant sensor receptacle (shapes RR1, RR2, CC1, CC3, ORC5, or EM1). The sensing/communication module must be D4i certified and directly connect to the DALI-bus terminals of a D4i-certified LED driver via a 2-wire connection. The sensing/communication module must, at minimum, provide occupancy and ambient light sensing capabilities.	**Possible Points** n/a
Which shape/size receptacle(s) is the sensor designed to be installed in? (Enter one of the following shapes from Zhaga Book 20: R44x17, R60x22, C22-T1A, C22-T1B, C22-T2, and/or one of the following shapes from NEMA LS 20000-2021: RR1, RR2, CC1, CC3, ORC5, EM1)	
Points are not applicable for this requirement.	n/a

Provide any additional notes you would like the Expert Reviewer Panel to know about the luminaire level lighting control sensor.	

Grid Services Capable	**The capability of the connected system to provide grid services including load shed and load modulation**
Minimum Requirement(s) The system must be able to temporarily reduce the power demand of the lighting system in response to a signal (i.e., from a utility) without manual intervention. The method for configuring the system response shall facilitate the specification of a change in power relative to the current power or lighting level and be accessible through a user interface and be specifically described. The system must be OpenADR 3.0 compliant.	**Possible Points** Eight points (+8) will be awarded for systems that have the capability to configure the system to respond to an OpenADR 3.0 price signal with a varying system response at different price levels. The method for configuring the system response must be accessible through a user interface and be specifically described. Seven additional points (+7) will be awarded for systems that include configuration features to facilitate meeting/maintaining occupant needs in the event of a grid services/demand response event. The system must include a configurable ramp rate and the ability to define spaces that will 1) always respond, 2) respond conditionally, and 3) never respond to a grid services/demand response event. Conditional responses must include, at a minimum, occupancy and daylight inputs. The method for configuring the system response must be accessible through a user interface and be specifically described.
Is the system able to respond to an OpenADR 3.0 price signal with varying system response at different price levels? (Enter Yes or No)	
Does the system include configuration features to meet/maintain occupant needs including configurable ramp rate and conditional responses? (Enter Yes or No)	
How many grid services capable points are earned for these capabilities? (Enter 0, 8, or 15)	
Provide any additional notes you would like the Expert Reviewer Panel to know about the grid services capabilities or points earned.	

U.S. Installation	A real installation of the connected system at a commercial or institutional facility located in the United States
Minimum Requirement(s) The competitor must document at least one U.S. installation of the connected system that can be physically visited by DOE. The installation must be in one of the targeted applications of the L-Prize as described in section I.3: TARGETED APPLICATIONS, SYSTEMS, AND LUMINAIRE TYPES. The installation must include control of at least 20 luminaires by the system and be able to demonstrate the following capabilities: • Addressability • All strategies of the Lighting Control Strategies requirement, including manual on/off/dim capabilities • Energy reporting • Fault detection and diagnostics (basic system faults only) • Luminaire Level Lighting Control. The installation must utilize the commercially available and manufactured connected system that was submitted for entry, and should not utilize any prototype components. The installation site must not be one of the competitor's own facilities or directly affiliated with the competitor. DOE and the Expert Reviewer Panel may visit the site(s) to observe, document, and confirm the installations.	**Possible Points** Fifteen points (+15) will be awarded for installation sites where the lighting system is integrated with the HVAC system and lighting system occupancy or other data is used to optimize HVAC operation for energy savings benefits.
Is the lighting system integrated with the HVAC system, and lighting system occupancy or other data used to optimize HVAC operation for energy savings benefits?	
How many U.S. installation points are earned based on this integration? (Enter 0 or 15)	
Provide any additional notes you would like the Expert Reviewer Panel to know about the U.S. installation or points earned.	

Commercial Availability	**The commercial availability of the connected system including complete product literature and marketing materials**
Minimum Requirement(s) The connected system must be fully commercially available for purchase with complete, final documentation and literature readily available on the manufacturer's website. The connected system components must all be certified with all appropriate electrical and fire safety certifications.	**Possible Points** n/a
Enter the location of the product website listing and spec sheets, marketing materials, installation guides, and other relevant product documentation to indicate full commercial availability.	
List documentation demonstrating appropriate safety certifications of the connected system from a recognized safety certification body such as UL, CSA, or ETL.	
Points are not applicable for this requirement.	n/a
Provide any additional notes you would like the Expert Reviewer Panel to know about the commercial availability.	