L•PRIZE®

U.S. Department of Energy

Prototype Phase Informational Webinar
August 3, 2022

Housekeeping

- Attendees will be on mute throughout the presentation

- If you have any questions, please type them into the Q&A panel and we will do our best to address each question

- We may be unable to answer some technical or teaming questions. Answers to all questions received will be posted in the HeroX Forum following the webinar: www.herox.com/LPrize/forum

Speakers

Emily Evans
National Renewable
Energy Laboratory

Wyatt Merrill
U.S. Department
of Energy

Gabe Arnold
Pacific Northwest
National Laboratory

Kate Hickcox
Pacific Northwest
National Laboratory

L-Prize

Introduction and Overview

PHASE 1: CONCEPT
UP TO 10 WINNERS
(**$20,000** EACH)

PHASE 2: PROTOTYPE
UP TO 6 WINNERS (**$2,000,000** PRIZE POOL)

TEAMING OPPORTUNITIES
FORM PARTNERSHIPS FOR PHASE 3

PHASE 3: MANUFACTURING & INSTALLATION
UP TO 4 WINNERS (**$10,000,000** PRIZE POOL)
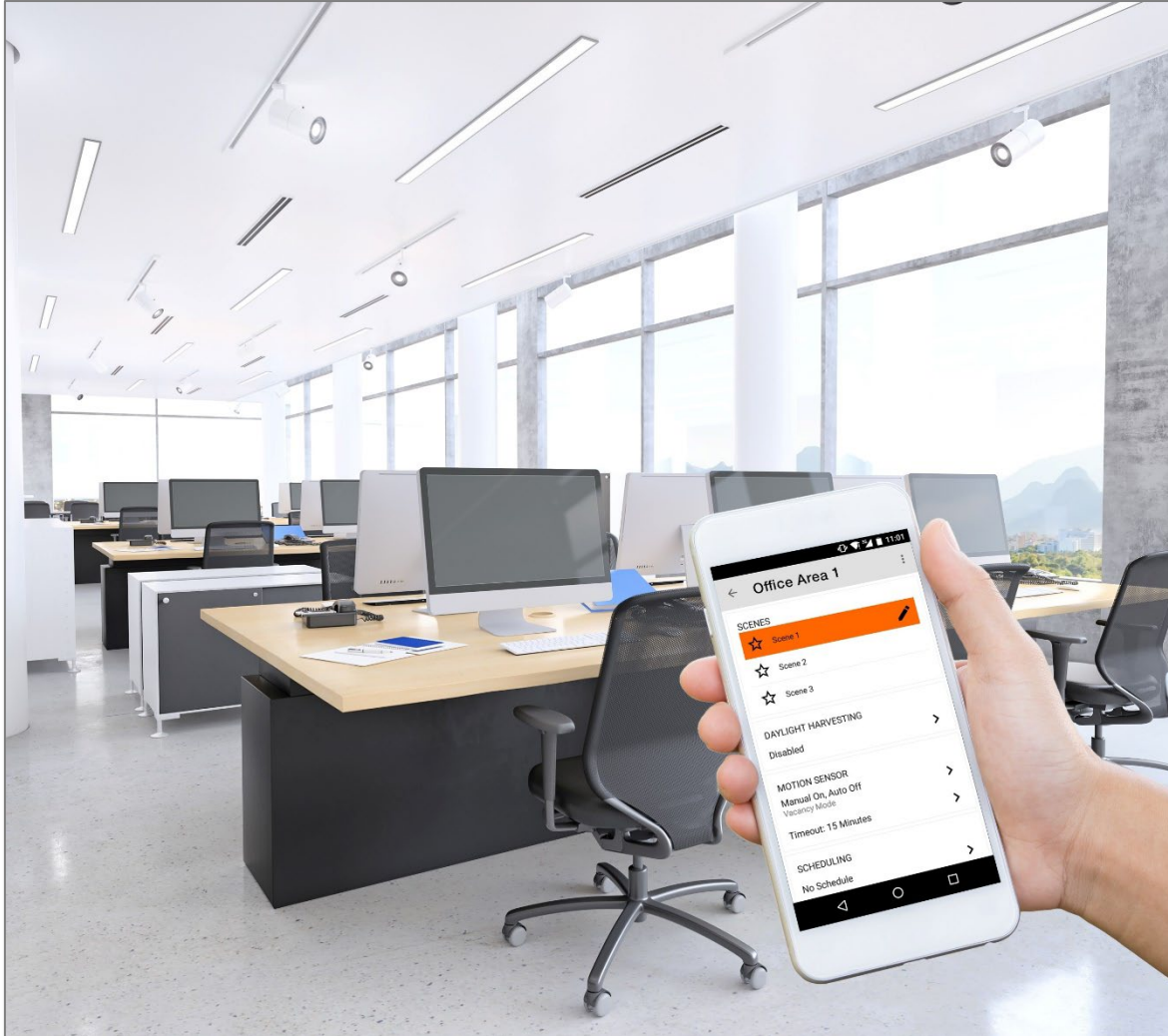
9 MONTHS

COMPLETED

13 MONTHS

OPEN NOW

22 MONTHS

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✉ LPrize@nrel.gov
americanmadechallenges.org/lprize

L-Prize Opportunity

The L-Prize targets linear lighting in commercial buildings where large energy savings potential remains and where lighting system connectivity and data can drive new value and building system optimization.

L-Prize Innovation Goals and Focus

Concept Phase

Participants:
Small players, nontraditional, students, individuals, etc. who receive feedback on their proposals from panel of experts

Criteria:
Quality of submission, innovation, and expected technical performance

Prizes:
$20k per winner, 4 winners awarded

Innovative concept proposals on paper that document lighting systems of the future

Prototype Phase

Participants:
Researchers, start-ups, small and large manufacturers

Criteria:
Technical performance, sustainability, approaches to address adoption hurdles, DEI

Prizes:
$2M prize pool, up to 6 winners

Real physical prototype systems, emphasizing technological innovation and challenging entrants to think outside standard forms, materials, and price points of commercially available products

M&I Phase

Participants:
Teams, small and large manufacturers

Criteria:
Technical performance, sustainability, approaches to address adoption hurdles, DEI, U.S. content and manufacturing, innovative deployment models

Prizes:
$10M prize pool, up to 4 winners

Demonstrate real-world viability with commercially available products and installations

- Efficacy
- Quality of Light
- Connectivity
- Product Life Cycle
- Technical Innovation
- Diversity, Equity, and Inclusion

- Competitors may participate in any phase of their choosing. New competitors are welcomed for each phase. There is no requirement for competitors to participate in all phases.

Future Manufacturing and Installation Phase

- Retains innovation requirements from Prototype Phase

- Adds additional requirements and/or incentives for:
  - U.S. content and assembly
  - U.S. installations
  - Innovative deployment business models

Production
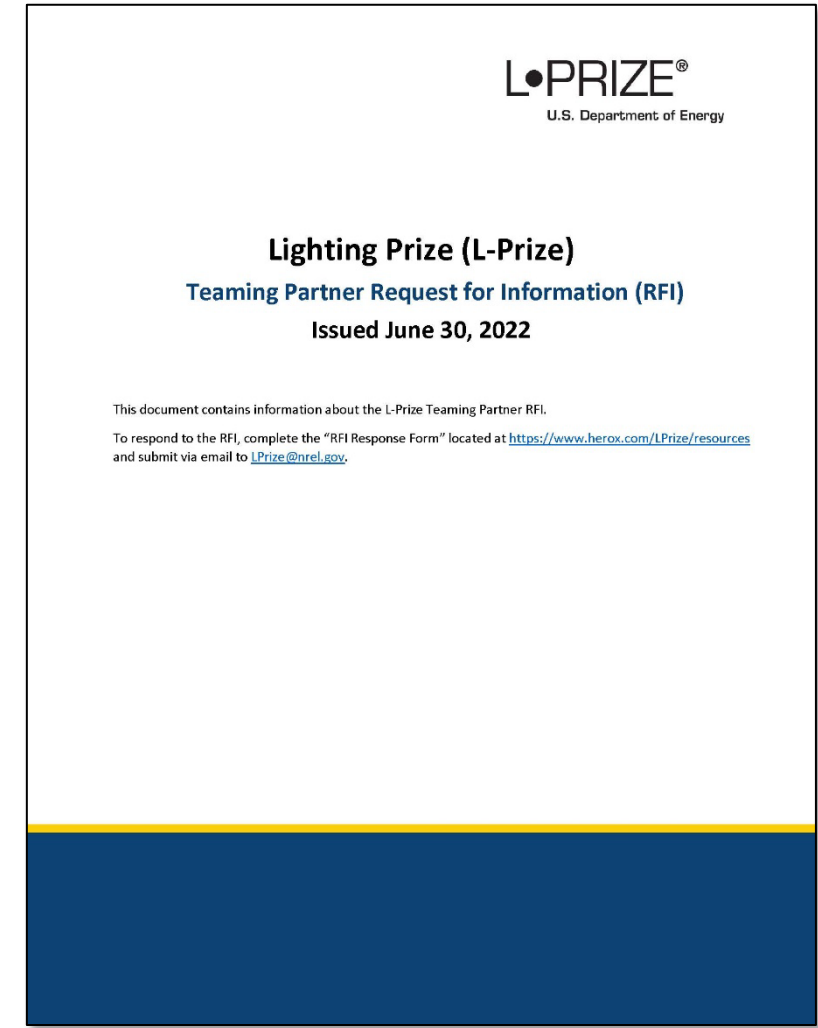
U.S. Content

U.S. Installations

Comments on Phase 3 Rules — Due January 13, 2023

- DOE invites comments on the draft requirements and timeline for Manufacturing and Installation Phase

- Any revisions to requirements or timeline of Manufacturing and Installation Phase will be announced with the opening of that phase

- Download the Comment Form at www.herox.com/LPrize/resources

L-Prize® — **Manufacturing and Installation Phase Comment Form**

Rules Document Location:	https://americanmadechallenges.org/lprize/docs/L-Prize_Official_Rules.pdf
Version:	Version 2, released June 30, 2022
Comments Due:	January 13, 2023

Instructions and Background:

DOE invites comments on the DRAFT L-Prize Manufacturing and Installation (M&I) Phase requirements and timelines. DOE w based on the input received. Any changes to requirements or timeline of the M&I phase will be announced with the opening

Please follow these steps to ensure your comments are received and considered by the L-Prize Team:
1. Enter your Organization, Name, Email Address, and Phone Number in Row 8 of this worksheet.
2. After your review of the Rules Document, please consider each Key Question in Columns B and C and submit your answer in Colu
3. Detailed comments are encouraged and should be added beginning in Row 18 of the worksheet. Please enter the section and pag
4. Enter your comment in Column D "Comment and Rationale". If applicable, please provide alternate approaches and data to supp
5. Save this Excel file with your comments and include your organization name appended to the end of the filename (for example: "
6. Email the file to **Lprize@NREL.gov** by close of business, **January 13, 2023**

Reviewer Organization	Reviewer Name	Reviewer Email Address

#	Key Questions	Answers to Key Questions
1	Are the timelines feasible for the Manufacturing and Installation Phase?	
2	Are there any hurdles that are preventing you from participating? Is there something DOE should consider, change, or include that would encourage you to participate?	

Teaming Opportunity

- Teaming partners may be needed for the final Manufacturing and Installation Phase

- DOE seeks manufacturing partners, materials or component suppliers, end-user installation host sites, utilities, energy service companies, and others interested in collaborating with or supporting an L-Prize team

- Teaming list will be posted and regularly updated

- View the Teaming RFI and Teaming partner list under Resources at https://www.herox.com/LPrize

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Lighting Prize (L-Prize)
Teaming Partner Request for Information (RFI)
Issued June 30, 2022

This document contains information about the L-Prize Teaming Partner RFI.

To respond to the RFI, complete the "RFI Response Form" located at https://www.herox.com/LPrize/resources and submit via email to LPrize@nrel.gov.

L-Prize

Prototype Phase Overview

Prototype Phase – What's New?

1 Separate tracks for luminaires and connected systems

2 More possible winners: up to 6

3 Expanded innovation opportunities for technical innovation and DEI

Luminaire Track

Efficacy
- ✓+❑ Luminaire efficacy

Quality of Light
- ✓ Chromaticity
- ✓ Dimming range
- ✓ Glare control
- ✓ Light output
- ✓ Spectral power data
- ✓+❑ Color rendition
- ✓+❑ Flicker
- ❑ White-tunable

Connectivity
- ✓ Standards-based digital driver
- ✓ Standards-based sensor port and connector

Product Life Cycle
- ✓ Driver lifetime
- ✓ Chromaticity maintenance
- ✓+❑ Lumen maintenance
- ✓+❑ Circular design
- ❑ Materials and sustainability innovation

Technical Innovation
- ❑ Application efficiency
- ❑ Form factor and aesthetics
- ❑ Value proposition and cost

Diversity, Equity, and Inclusion
- ❑ DEI plans and protocols
- ❑ DEI gaps and opportunities
- ❑ DEI deployment and application

Connected Systems Track

Connectivity
- ✓ Standards-based luminaire or system controller
- ✓ Interoperability
- ✓ Addressability
- ✓ Energy reporting
- ✓ Lighting control strategies
- ✓ Standards-based luminaire-level lighting control
- ✓+❑ System resilience
- ✓+❑ Fault detection and diagnostics
- ✓+❑ Grid services capable

Product Life Cycle
- ❑ Life cycle and sustainability innovation

Technical Innovation
- ❑ Ease of installation and use
- ❑ Compatibility and interoperability
- ❑ Value proposition and cost

Diversity, Equity, and Inclusion
- ❑ DEI plans and protocols
- ❑ DEI gaps and opportunities
- ❑ DEI deployment and application

Key
- ✓ = Mandatory
- ✓+❑ = Mandatory + Points Available
- ❑ = Points Only

Prototype Phase Structure – How do you win?

- **Separate tracks for luminaires and connected systems; competitors may submit entries to one or both tracks**

- **Submissions will be reviewed by Expert Reviewer Panel (ERP)**

  - ERP = Independent experts with expertise in lighting science, LEDs, engineering, energy efficiency, connected lighting, sustainability, DEI considerations, and lighting manufacturing

- **ERP will recommend submissions that meet minimum requirements and earn most points to DOE as winners**

  - Some available points are prescriptive (meet a specific threshold of performance and earn a predefined number of points)

  - Some available points are subjective (e.g., ERP will assign points on a scale of 0 to 5 for a particular area of innovation)

Luminaire Track – Minimum Requirements and Possible Points Summary

Category	Topic	Minimum Requirement(s)	Possible Points per Topic	Max pts
Efficacy	Luminaire Efficacy	≥150 lm/W	Up to 20 pts. for higher efficacy performance above 150 lm/W	20 pts.
Quality of Light	Light Output	> 2,000 lm	n/a	10 pts.
	Color Rendition	Preference rating of P2, fidelity rating of F3	5 pts. for improved preference rating of P1	
	Chromaticity	4000K, Duv between -0.006 and 0.000	n/a	
	Glare Control	UGR ≤ 22	n/a	
	Temporal Light Modulation (Flicker)	Fundamental frequency > 90 Hz, SVM ≤ 0.9	5 pts. for improved flicker performance SVM ≤ 0.4	
	Dimming Range	Dims to 5% or lower	n/a	
	Spectral Power Data (SPD)	SPD in ≤5-nm increments	n/a	
	White-Tunable	Must be configured for 4000K operation	n/a	
Connectivity	Standards-Based Digital Driver	Uses D4i-compliant smart driver	n/a	n/a
	Standards-Based Sensor Port and Connector	Contains Zhaga Book 20-compliant sensor port and connector	n/a	
Product Life Cycle	Circular Design	TM66 CEAM-Make ≥ 1	4 pts. for TM66 CEAM-Make ≥ 2; additional 4 pts. for TM66 CEAM-Make ≥ 3	20 pts.
	Lumen Maintenance	L_{70} ≥ 50,000 hrs	2 pts. for L_{90} ≥ 36,000 hrs	
	Chromaticity Maintenance	≤ 0.002 after 6,000 hrs	n/a	
	Driver Lifetime	≥ 50,000 hrs	n/a	
	Materials and Sustainability Innovation	No minimum requirement	Up to 10 pts. for submission features as scored by the Expert Reviewer Panel	
Technical Innovation	Technical Innovation	No minimum requirement	Up to 15 pts. for submission features as scored by the Expert Reviewer Panel	15 pts.
Diversity, Equity, and Inclusion	Diversity, Equity, and Inclusion	No minimum requirement	Up to 15 pts. for submission documentation as scored by the Expert Reviewer Panel	15 pts.

Luminaire Track - Efficacy

Up to 20 points possible

Efficacy

✓+☐ Luminaire efficacy

- **Luminaire efficacy must be ≥ 150 lm/W**
  - Additional Points:
    - ≥ 160 lumens per watt = 4 additional points
    - ≥ 170 lumens per watt = 8 additional points
    - ≥ 180 lumens per watt = 12 additional points
    - ≥ 190 lumens per watt = 16 additional points
    - ≥ 200 lumens per watt = 20 additional points

Key
✓ = Mandatory
✓+☐ = Mandatory + Optional Points
☐ = Optional Points Only

Please see Appendices A+B of Official Rules for all Prototype Phase requirement details: www.herox.com/LPrize/resources

Luminaire Track – Quality of Light

Up to 10 points possible

Quality of Light

- ✓ Chromaticity
- ✓ Dimming range
- ✓ Glare control
- ✓ Light output
- ✓ Spectral power data
- ✓ +❑ Color rendition
- ✓ +❑ Flicker
- ❑ White-tunable

- Chromaticity = 4,000K, D_{uv} between -0.006 and 0.000

- Dims to 5% or lower

- Light output > 2,000 lm

- Spectral power data SPD available in ≤5-nm increments

- UGR ≤ 22 in standard applications defined by CIE 190:2010

- Color rendition preference rating of P2, fidelity rating of F3 using IES TM-30 metrics
  - Additional points: 5 pts. available for improved preference rating of P1

- Temporal Light Modulation (aka flicker) SVM ≤ 0.9 required
  - Additional points: 5 pts. available for improved SVM ≤ 0.4

- White-tunable is optional = if white-tunable, L-Prize will evaluate metrics at 4,000k operation for Prototype Phase

Key
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✓+❑ = Mandatory + Optional Points
❑ = Optional Points Only

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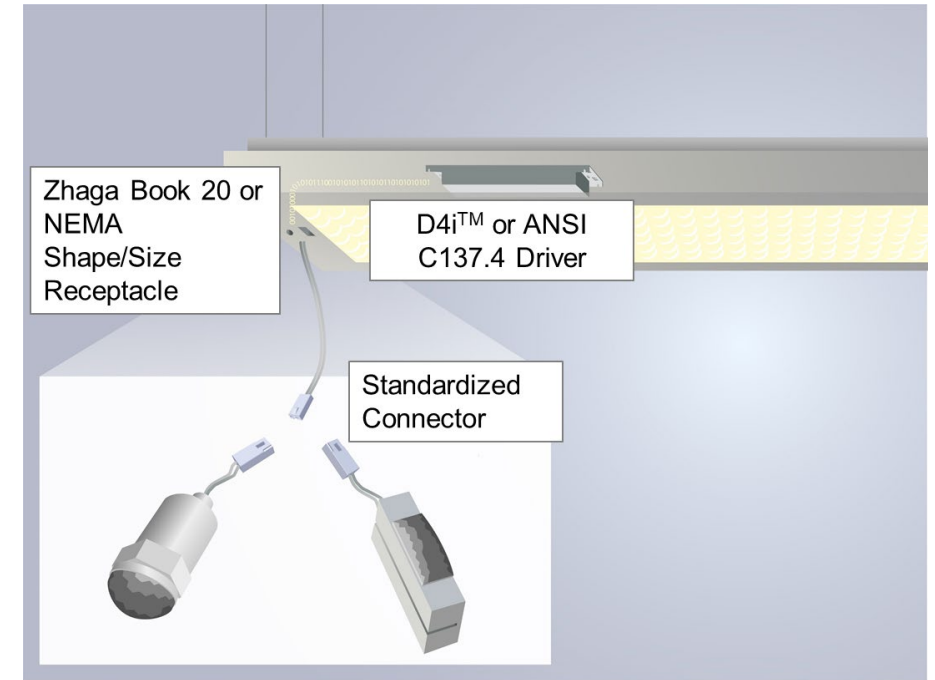
Luminaire Track – Connectivity

0 points possible; all minimum requirements

Connectivity

- ✓ Standards-based digital driver
- ✓ Standards-based sensor port and connector

- D4i or ANSI C137.4-2021 compliant driver
- **Zhaga Book 20 or NEMA LS 20000-2021 compliant sensor port**
  - NEMA sensor shapes RR1, RR2, CC1, CC3, or EM1 only
- **2-wire connector from sensor port to D4i or ANSI C137.4 compliant driver**

Zhaga Book 20 or NEMA Shape/Size Receptacle

D4i™ or ANSI C137.4 Driver

Standardized Connector

Key
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❑ = Optional Points Only

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Luminaire Track – Product Life Cycle

Up to 20 points possible

Product Life Cycle
✓ Driver lifetime
✓ Chromaticity maintenance
✓ +☐ Lumen maintenance
✓ +☐ Circular design
☐ Materials and sustainability innovation

- **Driver lifetime ≥ 50,000 hrs**

- **Chromaticity maintenance ≤ 0.002 after 6,000 hrs**

- **L_{70} ≥ 50,000 hrs**
  - Additional points: 2 points available for L_{90} ≥ 36,000 hrs

- **Circular design: must score ≥ 1 using CIBSE TM66 Circular Assessment Tool**
  - Additional points: 4 points available for score ≥ 2; 8 points available for score ≥ 3

- **Materials and sustainability innovation:**
  - Open invitation for innovations that support improved material transparency or material health
  - Additional points: up to 10 points as scored by Expert Reviewer Panel

Material transparency:
- the disclosure of the ingredients and processes used to create materials or products
- their potential human health effects, environmental impacts, or social equity

Material health:
- the sustainability quality or "health" of materials themselves
- how these materials may affect humans and ecosystems

Key
✓ = Mandatory
✓ +☐ = Mandatory + Optional Points
☐ = Optional Points Only

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Luminaire Track – Technical Innovation

Up to 15 points possible

Technical Innovation
❑ Application efficiency
❑ Form factor and aesthetics
❑ Value proposition and cost

- **Application efficiency:**
  - Open invitation for innovations that improve in-application efficiency such as improved optics/distribution
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Form factor and aesthetics:**
  - Open invitation for innovations in form factor or aesthetics that improve acceptability or adoptability of solution
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Value proposition and cost:**
  - Open invitation for innovations that reduce cost, improve cost-effectiveness, or improve value proposition
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

Key
✓ = Mandatory
✓+❑ = Mandatory + Optional Points
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Luminaire Track – Diversity, Equity, and Inclusion

Up to 15 points possible

Diversity, Equity, and Inclusion

- ❏ DEI plans and protocols
- ❏ DEI gaps and opportunities
- ❏ DEI deployment and application

- **DEI Plans and Protocols:**
  - Open invitation for competitors to demonstrate organizational-level DEI goals and strategies
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Gaps and Opportunities:**
  - Open invitation for competitors to demonstrate how growth and iterations in DEI approaches will be achieved, and how DEI gaps and opportunities are uncovered in the organization
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Deployment and Application:**
  - Open invitation for competitors to demonstrate DEI in adoption, application or distribution of products
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

Key
- ✓ = Mandatory
- ✓+❏ = Mandatory + Optional Points
- ❏ = Optional Points Only

Please see Appendices A+B of Official Rules for all Prototype Phase requirement details: www.herox.com/LPrize/resources

Connected Systems Track – Minimum Requirements and Possible Points Summary

Category	Topic	Minimum Requirement(s)	Possible Points per Topic	Max Pts
Connectivity	Standards-Based Luminaire or System Controller	Interoperable with D4i or ANSI C137.4 compliant drivers and/or sensors	n/a	40 pts.
	Technical Interoperability	Complies with industry standard specification for basic network connectivity	n/a	
	Application Interoperability	Access to zone, occupancy, faults, energy data	n/a	
	Addressability	All luminaires and devices are addressable	n/a	
	Cybersecurity	Not required for Prototype Phase	n/a	
	Energy Reporting	Energy reporting capability required	n/a	
	Lighting Control Strategies	Task, schedule, occupancy, daylight control required	n/a	
	System Resilience	Maintains control after temporary loss of connection to network or power	8 pts. for maintaining control after loss of connection to gateway	
	Fault Detection and Diagnostics (FDD)	Reports basic system faults	Up to 16 pts. for advanced, predictive FDD capabilities	
	Standards-Based Luminaire Level Lighting Control (LLLC)	D4i or ANSI C137.4 compliant sensing/communication module per luminaire	n/a	
	Grid Services Capable	OpenADR 2.0a demand response required	Up to 16 pts. for advanced grid services capabilities using OpenADR 2.0b	
Product Life Cycle	Life Cycle and Sustainability Innovation	No minimum requirement	Up to 10 pts. for submission features as scored by the Expert Reviewer Panel	10 pts.
Technical Innovation	Technical Innovation	No minimum requirement	Up to 15 pts. for submission features as scored by the Expert Reviewer Panel	15 pts.
Diversity, Equity, and Inclusion	Diversity, Equity, and Inclusion	No minimum requirement	Up to 15 pts. for submission documentation as scored by the Expert Reviewer Panel	15 pts.

Connected Systems Track – Connectivity

Up to 40 points possible

Connectivity

- ✓ Standards-based luminaire or system controller
- ✓ Standards-based luminaire-level lighting control
- ✓ Interoperability
- ✓ Addressability
- ✓ Energy reporting
- ✓ Lighting control strategies
- ✓+❑ System resilience
- ✓+❑ Fault detection and diagnostics
- ✓+❑ Grid services capable

- Interoperable with D4i or ANSI C137.4 compliant drivers and/or sensors
- D4i or ANSI C137.4 compliant LLLC sensor to be installed in luminaires
- API with access to zone, occupancy, faults, energy data
- All luminaires and devices are addressable
- Energy measurement and reporting capability required
- Task tuning, occupancy sensing, scheduling, daylight harvest control required
- Maintains control after temporary loss of connection to network or power
  - Additional Points: 8 pts. available if maintains control after loss of connection to gateway
- **Must report basic system faults**
  - Additional Points: up to 16 pts. available for diagnosing or predicting faults
- **Must be OpenADR 2.0a compliant for DR**
  - Additional Points: up to 16 pts. for advanced demand response using OpenADR 2.0b

Key
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- ❑ = Optional Points Only

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Connected Systems Track – Product Life Cycle

Up to 10 points possible

Product Life Cycle

☐ Life cycle and sustainability innovation

- **Life cycle and sustainability innovation:**
  - Open invitation for innovations that support positive environmental impacts such as improve circularity, end-of-life outcomes, reduction in harmful materials, or improved material transparency
  - Additional points: up to 10 points as scored by Expert Reviewer Panel

Material transparency:
- the disclosure of the ingredients and processes used to create materials or products
- their potential human health effects, environmental impacts, or social equity

Key
- ✓ = Mandatory
- ✓+☐ = Mandatory + Optional Points
- ☐ = Optional Points Only

Please see Appendices A+B of Official Rules for all Prototype Phase requirement details: www.herox.com/LPrize/resources

Connected Systems Track – Technical Innovation

Up to 15 points possible

Technical Innovation

- ❑ Ease of installation and use
- ❑ Compatibility and interoperability
- ❑ Value proposition and cost

- **Ease of installation and use:**
  - Open invitation for innovations that that simplify or improve ease of installing, configuring, operating, or maintaining connected lighting system
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Compatibility and interoperability:**
  - Open invitation for innovations that that improve compatibility and interoperability with other lighting and/or non-lighting devices and systems
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Value proposition and cost:**
  - Open invitation for innovations that reduce the cost, improve cost-effectiveness, and/or improve the value proposition of connected lighting systems
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

Key
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Connected Systems Track – Diversity, Equity, and Inclusion

Up to 15 points possible

Diversity, Equity, and Inclusion

- ❑ DEI plans and protocols
- ❑ DEI gaps and opportunities
- ❑ DEI deployment and application

- **DEI Plans and Protocols:**
  - Open invitation for competitors to demonstrate organizational-level DEI goals and strategies
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Gaps and Opportunities:**
  - Open invitation for competitors to demonstrate how growth and iterations in DEI approaches will be achieved, and how DEI gaps and opportunities are uncovered in the organization
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

- **Deployment and Application:**
  - Open invitation for competitors to demonstrate DEI in adoption, application or distribution of products
  - Additional points: up to 5 points as scored by Expert Reviewer Panel

Key
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Please see Appendices A+B of Official Rules for all Prototype Phase requirement details: www.herox.com/LPrize/resources

DEI, Product Life Cycle and Sustainability Webinars

Registration link:
https://us02web.zoom.us/webinar/register/WN_u72dnobrTYuo9fj9zHsSbw

Registration link:
https://us02web.zoom.us/webinar/register/WN_5PZE0d8yRqKh7eNrCavaXw

# Prototype Phase Timeline and Submission Package

Competitors submit working physical prototype luminaires or connected systems

- WHO: Manufacturers, designers, researchers, universities, individuals, etc.

Prototype Phase opened June 30, 2022	Intents to Submit due Jan. 13, 2023	Prototype entries due May 1, 2023	DOE announces Prototype Phase winner(s) July 2023
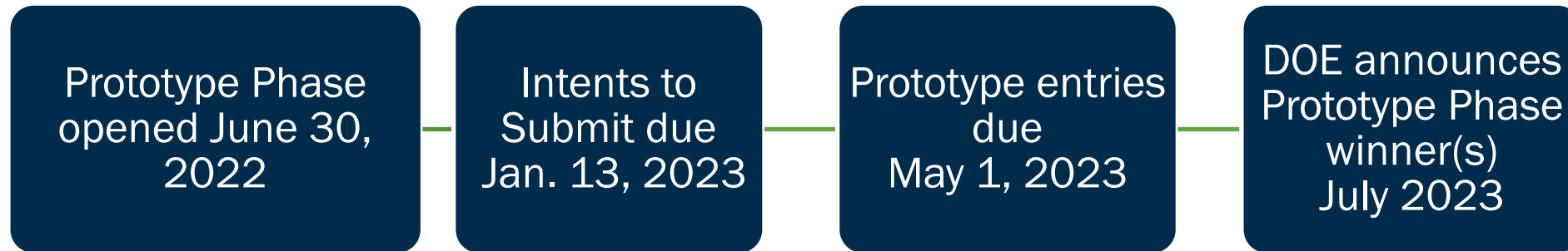
A complete submission package will include:

- Cover page, which may be released to the public by DOE
- PowerPoint summary slide, which may be released to the public by DOE
- Technical Documentation described in Appendices A+B
- Completed Technical Performance and Scoring Form
- Description of key innovations and features
- Three complete working prototype luminaires or connected systems
- Systems one-line diagram and instructions (Connected Systems Track only)

Prototype Phase Prizes
Up to 6 winners
split $2 million
based on points
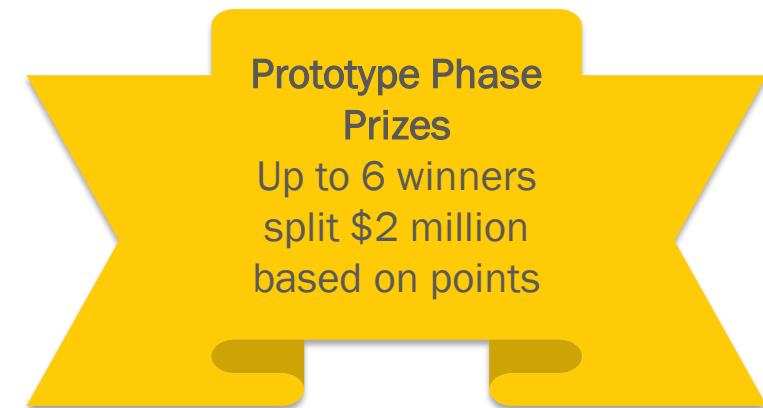
L-Prize

HeroX Overview

Official Rules of the

L-Prize are available online

https://americanmadechallenges.org/challenges/lprize/docs/L-Prize_Official_Rules.pdf

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Lighting Prize (L-Prize)
PROTOTYPE PHASE OFFICIAL RULES
AND
MANUFACTURING AND
INSTALLATION PHASE DRAFT RULES
Issued June 30, 2022

The L-Prize® will advance the state of the art in light-emitting diode (LED) lighting, encouraging technology developers and researchers to engage in advanced lighting system development leading to groundbreaking designs, products, and impact.

Follow or Compete at www.herox.com/LPrize

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QUESTIONS?

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