



[6450-01-P]

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

H2 Refuel H-Prize Final Guidelines Update

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy (DOE).

ACTION: Notice of Updates to the H2 Refuel H-Prize Competition Guidelines.

SUMMARY: On October 28, 2014, the Department of Energy (DOE) announced in the Federal Register the \$1 million H2 Refuel H-Prize competition, allowing teams from across the United States to compete to develop systems that generate and dispense hydrogen from resources commonly available to residences (electricity or natural gas) for use in homes, community centers, businesses or similar locations, to supplement the current infrastructure roll-out and reduce barriers to using hydrogen fuel cell electric vehicles. The Federal Register notice announcing the competition included the H2 Refuel H-Prize Competition Guidelines. The purpose of today's notice is to update the H2 Refuel H-Prize Competition Guidelines. Substantive changes in this update provide additional information on communication expectations for finalists, expand the process used to resolve ties, correct a typographical error in the dispensing time criteria table, define how availability will be calculated, and provide a method to determine a winner in the event that no entry receives at least a minimum score of one for each of the scoring criteria (not including bonus criteria). In addition, language is added for

clarification where necessary. The section on the draft guideline public comments and responses is deleted. Finally, minor errors are corrected and contact information is updated.

DATES:

- Competition opened - **October 29, 2014.**
- Competition ends - **October 31, 2016:** data will be analyzed to determine winner Award of \$1 million prize, if the Panel of Judges determines that there is a winning entry.

For more information regarding the dates relating to this competition, see, section III.

Competition requirements and process, Key Dates, in the **SUPPLEMENTARY INFORMATION** section of this notice.

ADDRESSES:

The H-Prize website is <http://hydrogenprize.org>, where updates and announcements will be posted throughout the competition.

FOR FURTHER INFORMATION CONTACT:

Questions may be directed to--

Technical information: Katie Randolph at 240-562-1759 or by email at HPrize@ee.doe.gov.

Prize contest: Emanuel Wagner, Contest Manager, Hydrogen Education Foundation, at 202-457-0868 x360 or by email at EWAGNER@ttcorp.com.

SUPPLEMENTARY INFORMATION:

I. Introduction

Fuel cells powered by hydrogen from renewable or low-carbon resources can lead to substantial energy savings and reductions in imported petroleum and carbon emissions. Fuel Cell Electric Vehicles (FCEVs) are much more efficient than today's gasoline vehicles, and when fueled with hydrogen, produce only water vapor at the tailpipe. The hydrogen fuel can be generated from a range of domestic sources. While the commercial sale of FCEVs is rapidly approaching, infrastructure remains a major challenge, with only approximately 50 fueling stations in the United States, only 10 of which are operating as public stations.

The H-Prize was authorized under section 654 of the Energy Independence and Security Act of 2007 (Pub. L. 110-140). As efforts to build a hydrogen fueling station infrastructure are getting underway, the H2 Refuel H-Prize is intended to incentivize the development of small-scale systems for non-commercial fueling to supplement the larger-scale infrastructure development.

The H2 Refuel H-Prize anticipates award of a \$1 million prize to the top refueler system entry that can produce hydrogen using electricity and/or natural gas, energy sources commonly available to residential locations, and dispense the hydrogen to a vehicle, providing at least 1 kg per refueling. Systems considered would be at the home scale and able to generate and dispense 1-5 kg H₂/day for use at residences, or the medium scale, generating and dispensing 5-50 kg H₂/day. Medium scale systems would serve a larger community with multiple users daily, such as a large apartment complex or retail centers to fuel small fleets of vehicles (e.g., light duty automobiles, forklifts or tractors).

Interested parties can register and find more information, updates and pages where teams can discuss the prize at the H-Prize website: <http://hydrogenprize.org>. The Hydrogen Education Foundation (HEF) is currently administering the prize for the U.S. Department of Energy (DOE), and DOE will coordinate prize activities with HEF.

Teams will have a year to design a system that generates and dispenses hydrogen fuel that meets the criteria and identify a location where it can be installed and used. Twelve months after the competition

opens, teams will be required to complete registration and submit system designs and blue prints, plans for installation, and preliminary data to demonstrate that the system satisfies the minimum criteria (see Criteria section). Teams will also need to provide documented evidence of cooperation from the installation site. Of the teams that meet all of the minimum criteria, the top entries will be selected as finalists to enter the testing phase. The selected teams will then have seven months to install and begin operating their systems. The systems must be compatible with remote monitoring equipment to allow remote monitoring for the testing period; compatibility requirements will be posted on the H-Prize website. Starting 21 months after the competition opens, the finalist systems will be remotely monitored and tested, and approximately two months of data will be collected. At least one on-site visit will be performed to verify data and perform tests that cannot be done remotely. Teams must also provide requested information to a DOE designated entity for independent verification of the cost of the system and the cost of the generated hydrogen. The scoring criteria will be ranked and weighted.

Proposed Timeline

Current tentative date	Activity
March 2014	Draft Guidelines posted for public comment
April 2014	Comment period closes
October 2014	Competition opens H-Prize Website opens, including an online system to facilitate teaming and partnerships Teams design systems, collect data, identify installation location, and registers for the prize ahead of data submission deadline
September 2015	Rules and Guidelines updated
October 2015	Preliminary data submission deadline Teams will submit data, provide designs and blueprints and information about installation site, to indicate that the system is capable of meeting the base criteria
December 2015	Finalist teams are announced – go to testing stage Finalist Teams install systems and get them up and running
July 2016	Remote monitoring equipment will be installed by the designated data analysis team to begin system testing
October 2016	Competition ends – data is analyzed to determine winner
December 2016 (tentative)	Anticipated winner announcement

II. Prize criteria and testing

Finalist selection phase

Twelve months after the competition opens, teams interested in competing must have completed registering for the competition and submit all required information. To be considered, an entry must meet the initial selection criteria defined below. Teams will be required to submit data that demonstrates the system's ability to meet the indicated criteria. The top teams to provide convincing evidence that the entry could satisfy the minimum criteria will be selected as finalists for testing. Specific instructions will be posted on the H-Prize website detailing the required information. In addition to the required technical criteria data, teams will submit system descriptions and preliminary designs and installation concepts which will be evaluated by an expert panel to determine if the entries are likely to meet reasonable usability, cost and safety criteria. Usability refers to the ability of the system to be installed and used at the intended locations (e.g., considering footprint and noise), and to be easily operated by the average user (e.g., with minimum training and time). Because a goal of the H-Prize is to advance commercial applications of hydrogen energy technologies, the potential of the systems to ultimately be commercialized will also be evaluated, and a description of a pathway to commercial production of the systems, including manufacturing, will be requested. To evaluate the potential safety of the system, certain information will be requested, including a safety plan and a hazard analysis; specific instructions will be available at the H-Prize website. A safety page on the H-Prize website will provide updated information on safety issues and requirements for the safety plan and hazard analysis. To be selected as a finalist, contestant designs, installation details and safety plans must be judged adequately safe by a panel of safety professionals.

Minimum/Maximum Criteria Table

Criteria	Home	Community
Minimum dispensing pressure	350 bar	
Maximum dispensing time (standard fill)	10 hours	60 minutes
Min. hydrogen dispensed per day	1 kg	5 kg
Hydrogen purity	Meets SAE J2719 (Hydrogen Fuel Quality for	

	Fuel Cell Vehicles)
Fill method	Compliant with relevant codes (for automobiles, SAE J2601 Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles) and ensures that delivered hydrogen does not exceed the pressure and temperature limits of the vehicle storage tank.
Safety	Meets relevant safety codes and standards for installation in target location

Finalist competition

The finalist teams will have seven months to install their systems at a location of their choosing before testing begins. Among other considerations, entries must meet the safety codes and standards in effect at the installation location appropriate to the system. Further, all required permits and approvals must be received prior to system operations.

Each entry will be scored in six different technical and cost criteria:

- Dispensing pressure
- Dispensing time
- Number of standard fills per day
- Tested availability
- Total installed system cost (capital + installation)
- Direct user cost per kg

The criteria and scoring ranges are listed in more detail below.

Testing for the technical criteria will be performed remotely over a period of 2 to 3 months, with at least one on-site inspection to verify data and perform testing that cannot be done remotely. Summary level testing results will be published. The base criteria listed in Minimum/Maximum Criteria Table will be tested to ensure that all entries meet those requirements. A standard fill is defined as the delivery of 1 kg of hydrogen to a vehicle tank.

The cost criteria will be evaluated by an independent auditing entity. Teams will be required to submit cost information for the system entered into the competition, such as the bill of materials for the system, required parts for installation and system operating costs during the testing period, including information such as invoices and receipts for the equipment and other purchases. Specific details on required information will be provided to finalist teams after selection.

Entries will receive scores for the tested criteria as described below, with different multipliers for each of the criteria. When testing is complete, the data will be analyzed to determine scores. Once all results have been analyzed, judges will evaluate the results and determine the scores based on the published scoring criteria, and confirm entry eligibility based on the base criteria and eligibility requirements. After resolving any ties (see tie resolution process below), the eligible team with the highest score will be the winner.

Once selected, finalists are expected to communicate with HEF and DOE throughout the competition about any events that impact ability of the system to be completed and installed, and meet eligibility requirements by the beginning of testing (e.g., major delays in installation, safety events); and/or complete the testing by the October 31, 2016 deadline.

Installation site criteria

Any site in the 50 United States and the District of Columbia can be used for the installation of the refueler, as long as there is access for installing equipment for remote monitoring, at least one on-site visit for in-depth testing, and at least one visit by the press and public.

To meet testing requirements, the fueling system should be used at an average of at least 50% planned capacity per week (e.g., for a home system designed to dispense 1 kg/day, at least four 1-kg “fills” per week; for a community system designed to produce 20 kg/day, it should dispense at least 70 1-kg “fills” per week). If on-site hydrogen use is below this level, simulated fills can be used for testing. Simulated fill protocols will be posted on the H-Prize website before testing begins.

Entries must meet the safety codes and standards in effect at the installation location. Teams are encouraged to consider the relevant SAE, ASME and NFPA codes and standards.¹

¹ Codes and standards to consider include but are not limited to SAE J2719, ASME B31-12, ASME B31-3, ASME BPV Code, NFPA 2 and NFPA 70. Depending on the system, some codes and standards may not apply.

Prize criteria

The criteria were developed through discussion with experts in the field, including members of Hydrogen and Fuel Cell Technical Advisory Committee, other DOE offices, and federal agencies, and from responses to a Request for Information (DE-FOA-0000907: RFI - Home Hydrogen Refueler H-Prize Topic, http://www1.eere.energy.gov/financing/solicitations_detail.html?sol_id=600) and public comments on the draft criteria (79 FR 15737).

Each of the criteria is assigned a 1-5 point scale connected to different ranges. The initial evaluation for winner selection will only consider entries that receive at least the minimum score for each category (not including bonus criteria). In the event that no entry receives at least the minimum score for each category, the process used to determine the winner is defined in the Addendum to the Guidelines below. If any entry receives at least the minimum score for all categories, the Addendum will not be used and the winner will be determined as described below. For some criteria, the ranges for home and community systems may be different. A score multiplying factor will be used to weight the different criteria.

Dispensing Pressure		
Score	Home	Community
1	350 bar or higher	
2	400 bar or higher	
3	500 bar or higher	
4	600 bar or higher	
5	700 bar or higher (ultimate goal)	

Dispensing Pressure refers to the pressure of the hydrogen dispensed to the vehicle. Intermediate pressures are listed to incentivize advancements towards low-cost systems that can meet the ultimate target of 700 bar.

Dispensing time		
Score	Home	Community
1	10 hours/kg or less	60 minutes/kg or less
2	8 hours/kg or less	30 minutes/kg or less

3	5 hours/kg or less	15 minutes/kg or less
4	2 hours/kg or less	10 minutes/kg or less
5	30 minutes/kg or less	3 minutes/kg or less

Dispensing time is the time required to dispense a standard fill of hydrogen to a vehicle, including time required to connect the system to the vehicle and begin the hydrogen flow. Home systems may have longer fueling times, up to overnight, while multi-user systems are expected to have shorter fueling times.

Number of standard fills per day		
Score	Home	Community
1	1 or more	5 or more
2	2 or more	10 or more
3	3 or more	20 or more
4	4 or more	40 or more
5	5 or more	up to 50

The standard fills per day will be based on the highest number of actual or simulated fills completed in a 24 hour period.

Tested Availability		
Score	Home	Community
1	80% or higher	
2	85% or higher	
3	90% or higher	
4	95% or higher	
5	98% or higher	

Availability will be tested over a period of two to three months, during which time system usage will need to be at least 50% of the planned capacity per week. Any time spent on repairs or non-routine maintenance during the testing period will count as non-available, even if compensated for (e.g., repairs done during scheduled down-time, or using stored hydrogen). The following equation will be used to calculate availability:

$$A = (168 - Tr - Td - Te) / 168$$

(for weekly calculations; 24hours/day X 7 days=168 hours)

Tr = repair time (time (h) between when a repair or non-planned maintenance intervention is initiated and the system is returned to operational status).

Td = delay time (time (h) between when a failure occurs [system can no longer fill or generate hydrogen] and a repair is initiated).

Te = Maintenance time in excessive of original planned maintenance time

Finalists will be required to collect detailed maintenance logs. A template will be provided at a future date. Contestants must provide a preventative/planned maintenance schedule including anticipated downtime and cost (labor and materials) for each planned maintenance event during the submission phase. Planned maintenance cannot exceed 50 hours over the two months. Any maintenance exceeding the original planned amount will be counted against availability in the equation above as *Te*.

Total Installed System Cost (capital + installation)		
Score	Home	Community
1	\$25k/kg/day or less	\$15k/kg/day or less
2	\$20k/kg/day or less	\$12.5k/kg/day or less
3	\$15k/kg/day or less	\$10k/kg/day or less
4	\$10k/kg/day or less	\$7.5k/kg/day or less
5	\$5k/kg/day or less	\$5k/kg/day or less

Total Installed System Cost will be based on the actual cost for the system equipment (including balance of plant to the nozzle interface) as well as the installation costs. To eliminate installation cost variations based on geographic location or demonstration site type (e.g., actual home or community site vs. lab installation), DOE will have installation costs estimated by an independent entity based on the system feedstock (i.e., natural gas or electricity), capacity, fuel pressure, type (community vs. home), etc. The total cost for scoring will be based on the amount of hydrogen dispensed per day, up to the upper range for the system category (5 kg/day for the home system, 50 kg/day for the community system) – for example, a home system designed and demonstrated to dispense 1 kg/day with a total installed system cost of \$24,000 would score 1 point, while a system designed to dispense 2 kg/day at the same cost would

receive a score of 3. Teams will be expected to provide information such as the bill of materials for all components. Details of the specific information requested will be provided to the teams selected for testing. If the system proposed provides heat and/or power in addition to hydrogen for refueling, the total installed system cost of the entire system will be considered when scoring this criterion. Integrated systems that provide heat and/or power in addition to hydrogen for refueling will be awarded bonus points (see bonus points below).

Direct user cost per kg		
Score	Home	Community
1	\$20 or less	
2	\$17 or less	
3	\$14 or less	
4	\$11 or less	
5	\$8 or less	

Direct user cost per kg will be based on feedstock inputs and actual operations and maintenance costs during the testing period, divided by the amount of hydrogen that is produced and used. The direct user cost per kg excludes the capital and installation costs, which are included in the total installed system cost category. Feedstock cost inputs will be based on actual usage, using a single price for all entries for each input to eliminate regional variation, based on the EIA 2014 projections for average price to all users: \$0.098/kWh for electricity and \$6.60/million BTU for natural gas. A single price for water will also be set and used to calculate the direct user costs. All generated and used hydrogen is counted in determining the \$/kg – for example, a system that generates 10 kg/day, where 4 kg is used to fuel vehicles and 5 kg is used in a fuel cell to produce power would divide the daily user costs by 9.

Scoring

Scoring Criteria Category	Score multiplier
Dispensing pressure	3
Dispensing time	1
Standard fills per day	1

Tested Availability	2
Total installed system cost	2
Direct user cost per kg	1

A bonus score of up to 3 points will be awarded for integrated systems in order to offset the additional costs associated with adding heat and/or power, based on how much heat or power is provided.

Bonus points	
Points	Heat or power supplied
1	Supply at least 35 gallons of hot water per day
1	Supply at least 25,000 BTU/hr of space heating
1	Supply at least 10 kWh electricity per day

Scoring example

Example A: Makes all the lowest scores

Criteria Category	Result	Category Score	Score multiplier	Total scores
Dispensing pressure	360 bar	1	3	3
Dispensing time	8 hours	1	1	1
Standard fills per day	1	1	1	1
Tested Availability	81%	1	2	2
Total Installed System Cost	\$23k/kg	1	2	2
Direct user cost per kg	\$19/kg	1	1	1
Bonus categories	None	0	0	0
Total	--	--	--	10

Example B: Mixture of scoring levels

Criteria Category	Result	Category Score	Score multiplier	Total scores
Dispensing pressure	475 bar	2	3	6
Dispensing time	3 hours	3	1	3
Standard fills per day	3	3	1	3
Tested Availability	88%	2	2	4
Total Installed System Cost	\$18k/kg	2	2	4
Direct user cost per kg	\$11/kg	4	1	4
Bonus categories	Supplies hot water	1	--	1
Total	--	--	--	25

Judging and testing

A panel of independent judges will be assembled from experts in relevant fields, selected by DOE in consultation with HEF. Judges may be selected from organizations such as the Hydrogen Safety Panel, the Hydrogen and Fuel Cells Technical Advisory Committee, National Labs, and relevant federal agencies. An independent testing entity will be selected to perform remote and on-site technical data collection, and an independent auditing oversight entity will collect and analyze the cost data.

Tie resolution process

If the results for any of the technical criteria for different entries differ by less than the measurement error range, then those systems will be considered tied for that category and given the higher of the two scores (for example, if the pressure measurement error range is 5%, and Entry A has a dispensing pressure of 499 bar and Entry B has a pressure of 500 bar, both will be given 3 points for the category).

If the top entries' total scores are tied, the entry with the highest measured pressure will win; if the pressure measurements are within the measurement error, the entry with the highest measured availability will be selected as the winner. If the availabilities measurements are within the measurement error, the system with the most standard fills per day will be selected as the winner. If the number of standard fills per day is the same, the system with the shortest dispensing time will be selected as a winner. Otherwise, the entry with the highest score will win.

III. Competition requirements and process

Eligibility

This H-Prize Competition is open to contestants, defined as individuals, entities, or teams that meet the following requirements:

1. Comply with all Registration and H-Prize Competition Rules and Requirements as listed in this document and in any updates posted on the H-Prize website and/or the Federal Register;

2. In the case of an entity: be organized or incorporated in the United States, and maintain for the duration of the H-Prize Competition a primary place of business in the United States;
3. In the case of all individuals (whether participating singly or as part of an entity or team): be a citizen of, or an alien lawfully admitted for permanent residence into, the United States as of the date of Registration in the H-Prize Competition and maintain that status for the duration of the H-Prize Competition;
4. A team may consist of two or more individuals, entities, or any combination of both. All team members listed on the contestant roster must meet the requirements of individuals or entities.
5. Provide the following documentation:
 - a. In the case of U.S. Citizens: provide proof of U.S. Citizenship with Registration, as follows:
 - i. Notarized copy of U.S. Passport, or
 - ii. Notarized copies of both a current state-issued photo ID issued from one of the 50 States or a U.S. Territory and a birth certificate;
 - b. In the case of aliens lawfully admitted for permanent residence in the United States: Provide notarized copy of Permanent Resident Card (Form I-551)(green card) with Registration;
 - c. In the case of entities: Provide a copy of the entity formation documentation (e.g. Articles of Incorporation) showing the place of formation, as well as a self-certification of the primary place of business;
6. The contestant, or any member of a contestant, shall not be a Federal entity, a Federal employee acting within the scope of his or her employment, or an employee of a National Laboratory acting within the scope of his or her employment;
7. Sign a waiver of claims against the Federal Government and the HEF. *See* 42 U.S.C. § 16396(f)(5)(A);

8. Obtain liability insurance, or satisfactorily demonstrate financial responsibility, during the period of the H-Prize Competition. *See* 42 U.S.C. 16396(f)(5)(B)(i);
9. Name the Federal Government as an additional insured under the registered participants' insurance policy and agree to indemnify the Federal Government against third party claims. *See* 42 U.S.C. 16396(f)(5)(B)(ii);
10. Teams and Entities:
 - a. Each team or entity will designate a team leader as the sole point of contact with H-Prize Competition officials.
 - b. Team or entity members will be identified at the time of Registration on the contestant roster. Members participating on multiple teams will be required to disclose participation to each team.
 - c. Changes to contestant rosters will be allowed up to 72 hours prior to the award presentation, provided citizenship and immigration requirements are met.

Registration process

After announcement in the Federal Register, registration and all required eligibility documentation must be completed through the web site <http://hydrogenprize.org> no later than one week before the initial data submission deadline. Early registration is encouraged.

H-Prize Competition Schedule

Once registered, teams will receive all notices and rules updates, including answers to questions asked by the contestants. The public web site, <http://hydrogenprize.org>, will also post this same information, including publicity about various teams and sponsors. Contestants are encouraged to utilize the web site as a means of highlighting any information they would like to convey to the public or potential sponsors. There are no entry fees.

On **October 29, 2015** contestants will be required to submit initial data (including information on how the data was gathered and measured) and requested financial information for evaluation by a designated panel of judges. Instructions for the initial data submission will be posted on the web site and sent electronically to the designated contact person for each contestant.

Testing and evaluations are planned to be completed in October 2016. The winner will be determined after all testing data has been analyzed to determine scoring and any ties resolved as described above. DOE plans to select and announce a winner within three months after the close of the competition.

Intellectual property

Intellectual property rights developed by the contestant for H-Prize technology are set forth in 42 U.S.C. § 16396(f)(4). No parties managing the contest, including the U.S. Government, their testing laboratories, judges or H-Prize administrators will claim rights to the intellectual property derived by a registered contestant as a consequence of, or in direct relation to, their participation in this H-Prize Competition. The Government and the contestant may negotiate a license for the Government to use the intellectual property developed by the contestant.

Cancellation and team disqualification

A contestant may be disqualified for the following reasons:

- At the request of the registered individual or team leader;
- Failure to meet or maintain eligibility requirements (note that at the time of the prize award, if it is determined that a contestant has not met or maintained all eligibility requirements, they shall be disqualified without regard to H-Prize Competition performance);
- Failure to submit required documents or materials on time;
- Fraudulent acts, statements or misrepresentations involving any H-Prize participation or documentation; or,
- Violation of any federal, state or local law or regulation.

DOE reserves the right to cancel this prize program at any time prior to the completion of system testing.

Liability and competition costs

The Department of Energy, H-Prize, the Hydrogen Education Foundation and any sponsoring or supporting organization assume no liability or responsibility for accidents or injury related to the Prize.

The entrants are responsible for costs associated with participating in the competition including but not limited to designing, installing and operating their systems.

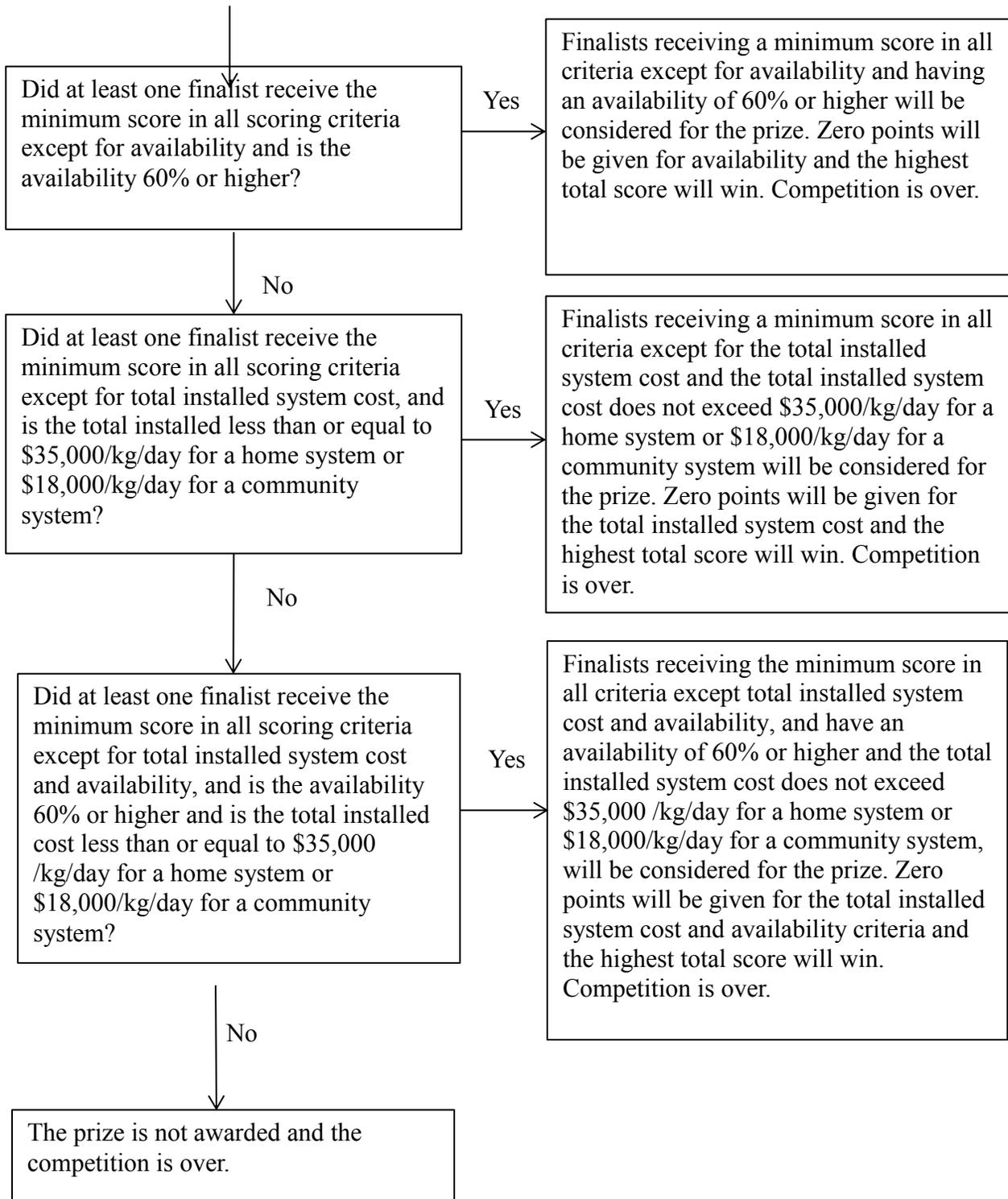
Key Dates

- **October 29, 2014:** Competition opens
- **October 29, 2015:** Preliminary data submission date
- **July 2016:** Finalist system testing begins
- **October 31, 2016:** Competition ends, data will be analyzed to determine winner
- **December 2016:** Anticipated award of \$1 million prize, if the Panel of Judges determines that there is a winning entry

Addendum

Since opening the competition, feedback has been received that two of the criteria may be overly ambitious and not achievable given technology status and competition timeline. As a result, DOE reassessed the criteria and determined that the total installed system cost and the availability criteria for both home systems and community system are very ambitious. Therefore, the following decision tree is provided to determine a winner in the event that no finalist receives at least a minimum score in each scoring category (scoring criteria does not include bonus criteria). In that scenario, the following decision tree will be used to determine the winner. **If any entry receives at least the minimum score for all scoring criteria, the Addendum will not be used and the winner will be determined as previously described.**

If no finalist receives at least a minimum score in each category:



Issued in Washington, DC on August 27, 2015.

Sunita Satyapal,

Fuel Cell Technology Office Director.

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