The Hydrogen Education Foundation's
Hydrogen Student Design Contest
2016: Development of a Hydrogen-powered Micro-Grid for Grid Support and Back-up Power
www.HydrogenContest.org

HYDROGEN EDUCATION FOUNDATION

NREL NATIONAL RENEWABLE ENERGY LABORATORY
U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

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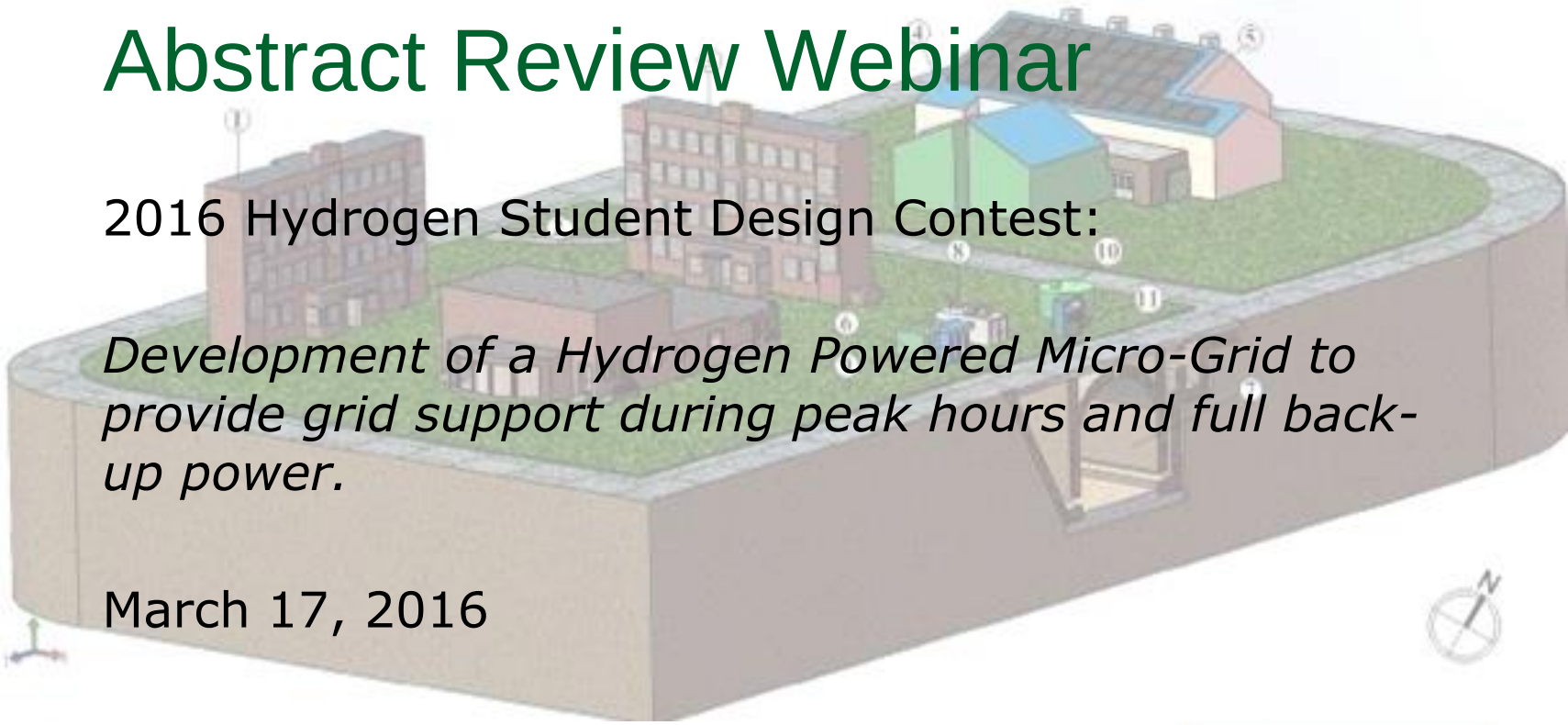
Abstract Review Webinar



2016 Hydrogen Student Design Contest:

Development of a Hydrogen Powered Micro-Grid to provide grid support during peak hours and full back-up power.

March 17, 2016

NREL NATIONAL RENEWABLE ENERGY LABORATORY
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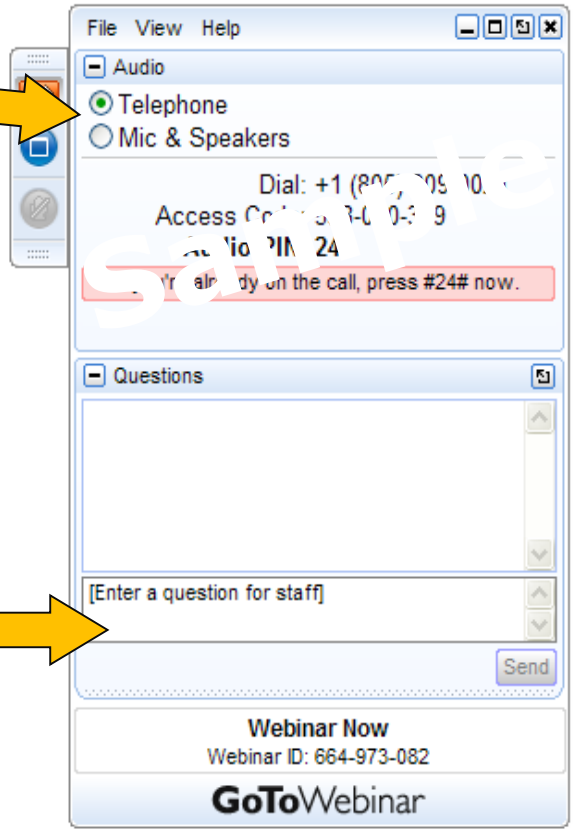
Before we get started…

Two Audio Options:

Streaming audio and dial-in

1. Streaming audio/computer speakers (default)
2. Dial-in: Use the audio panel to see dial-in instructions, then call in separately from your telephone



You may type your questions into the question box at any time; they will be answered at the end of the webinar.

This webinar will be recorded and emailed to participants following the webcast.

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And these supporting organizations:

NFCRC

CaSFCC California Stationary Fuel Cell Collaborative

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Webinar Agenda

1. Contest Progress
   - Vera Medici, Hydrogen Education Foundation (HEF)
2. Judge's Clarification: Fueling Station Design
3. Questions and Answers
   - Submitted by our student teams, answered by judges
4. Important Dates
5. Questions asked During the Webinar
6. Conclusions

Contest Overview

Participating teams:

- Arizona State University (United States)
- Bogor Agricultural University (Indonesia)
- California State University- Los Angeles (United States)
- Farmingdale State College (United States)
- Kyushu University (Japan)
- University of Manchester (England)
- North-West University (South Africa)
- University of South Florida (United States)
- Stanford University (United States)
- University of British Columbia (Canada)
- University of California- San Diego (United States)
- Universidad de Ingeniería y Tecnología (UTEC)- Team A, Team B, & Team C (Peru)
- University of Waterloo (Canada)
- Texas A&M University (United States)

Note Regarding Q & A

Some student teams have asked questions that are very specific to their individual designs. In the spirit of competition and not "give away" secrets of other teams' designs, we have answered broader questions for this webinar, and more detailed questions will be returned to teams privately.

Links that are shared on-screen during the webinar will be posted online after the webinar, as well as the webinar slides.

Our Advisors and Judges

Kim Cierpik-Gold, Ph.D.- Senior Project Engineer, Fuel Cell Technologies Office, DOE

Neha Rustagi- Technology Manager, Dept. of Energy

Lauren Bissey- Strategy Associate, Air Liquide

Nicholas Thomas - Project Engineer, Air Liquide

Judges' Clarification: Fueling Station Design

MICROGRIDS & FUELING STATIONS:

"Since the focus of the competition is the *design of a grid*, a *detailed engineering design of a unique fueling station is not necessary*.

Applicants must *describe the fueling station* they will incorporate, but they can *base that station on existing units* (e.g. those in California).

A characterization of the station performance capabilities should be included in the final application."

Questions about Peak Demand

Question 1a:

In the description of the contest, does the 10% of the peak power demand mean it is the excess part of the demand over the supply from the major grid or the overall power demand that we need to consider for the capacity of the microgrid?

Question 1b:

Is the 10% power supplied by hydrogen fuel cell to macro grid only in peak hours of consumption?

Answers about Peak Demand

Answers*:

- The 10% power supplied by the hydrogen fuel cell to the macro grid should be based on the amount of power needed during peak hours, but it should be capable of generating 10% of that amount all day.
- The actual point of peak demand is a period which represents the highest point of customer consumption of electricity. (The daily peak demand usually occurs around 5:30 PM.)
- The 10% of peak power should be based upon the demand which is calculated as your peak usage over a 15 minute time period. It is in kW, not kWh.

**There is a detailed link shared in a later slide*

Questions about Fueling Stations/Vehicles

Question 3: Drop-in fueling station is emphasized for the designing of the hydrogen microgrid. How important the role of the fueling station plays in the overall design of the microgrid?

Answer: The design for the fueling station will play a large part in how much hydrogen will be required to fuel the vehicles in addition to supporting the energy requirements of the microgrid. In this regard, defining the metrics for the fueling station will support the hydrogen production capacity required for both the fueling station and the energy production facility.

Question 4: For the hydrogen fuel cell vehicles, should those vehicle be from the designated microgrid facility or from the public to make extra profits from the excess hydrogen supply?

Answer: That could be your choice. The final application should however specify the number of vehicles being fueled by the hydrogen station.

Other Questions

Question 5: What is the meaning of HVAC systems? (Heating, Ventilation, and Air Conditioning or High Voltage Alternating Current)

Answer: HVAC = Heating, Ventilation, and Air Conditioning

Question 6: For a military base/other facility, how large is the scope of the facility, or is there any specific example that we can refer to as a model?

Answer: There are no specific examples to use as a model; you may use your judgement as to what fits your design best, keeping in mind that you will need to know the power requirements for the energy production component of your design as well as the number of vehicles in order to select the appropriate hydrogen generation system, fuel cell, etc. For station design, you may reference the H2FIRST Reference Station Design Report **Link will be shown in a later slide, and shared on the hydrogencontest.org*

Helpful Links

Clarification of 10% peak demand criteria:
www9.nationalgridus.com/niagaramohawk/non_html/eff_elec-demand.pdf

DOE's GREET model provides substantial data on the emissions associated with energy production technologies:
https://greet.es.anl.gov/

Case studies using GREET:
https://greet.es.anl.gov/publications

Helpful Links

Station design, power requirements and energy production; H2FIRST Reference Station Design Report: **http://energy.gov/sites/prod/files/2015/04/f22/fcto_h2first_reference_station_design_report_april2015_0.pdf**

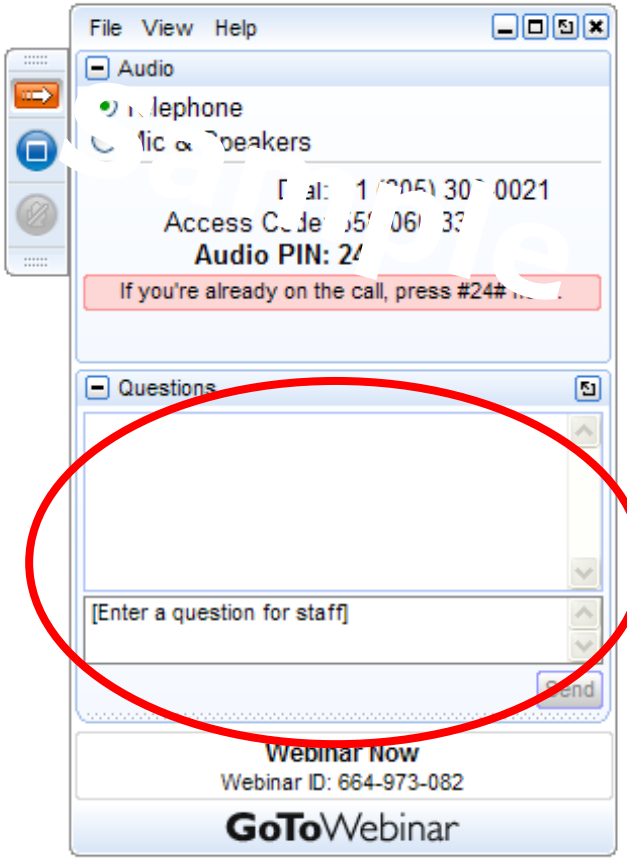
Thermodynamic properties table of hydrogen in SI units: **http://hydrogen.pnl.gov/hydrogen-data/hydrogen-properties**

Important Dates

- Timeline (dates are subject to revision)
  - March 17 – Webinar on Progress; Feedback
  - March-April – Feedback as needed
  - **April 18 – Final Submission Deadline**
  - May 16 – Winner notification
  - June 6-10 – Award ceremony/Announcement of Winner
- Sign up for our mailing list and always stay up to date on deadlines!

Question and Answer

- **Please type your question into the question box!**
- Check out the Contest website for FAQs, Rules& Guidelines, Past Entries: www.hydrogencontest.org



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